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THE PHILOSOPHICAL REVIEW

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July, 1931

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THE PHILOSOPHICAL REVIEW

AN ANONYMOUS TREATISE IN SIX BOOKS ON METAPHYSICS AND NATURAL PHILOSOPHY

THE intellectual interests of the fourteenth century and the state of knowledge at that time are presented as it were in bird's-eye view by an anonymous compendium of six books on metaphysics and natural philosophy preserved in a Latin manuscript at Paris.[1] The handwriting, in the opinion of the Director, M. Omont, is of the second half of the fourteenth century, or perhaps even the beginning of the fifteenth. But of course this manuscript may be a later copy and not the original composition. The name of the author is unknown, and his abstention from citing recent writers by name makes it difficult to place him chronologically with any nicety. He sometimes gives a personal detail, as when he speaks of wishing to prove to a Jew by natural reason that God could be incarnated.[2] But such passages are insufficient to identify him. Not improbably he was a doctor of theology, since in other passages analogous to that just mentioned he rather leaves the impression that he could discuss theological questions, did they not lie outside his present scope.[3]

[1] Numbered 6752 of the Latin MSS. in the catalogue of the Bibliothèque du roi, where it is dated as of the fourteenth century. A membrane codex of 239 leaves, of which the first three are left blank. The text is in a large legible hand. This manuscript will henceforth be designated as BN 6752.

[2] BN 6752, fol. 20v, "Unde cum dudum cuidam Hebreo probare vellem deum incarnari potuisse et hoc per rationem naturalem."

[3] *Idem*, "quia licet deum esse incarnatum sit catholicum et theologice inquirere ipsum tamen posse incarnari presentis speculationis apparet." *Ibid.*, fol. 46v, "Et licet articulum Parisiensem investigare sit potius catholicum quam philosophicum, quia tamen articulus favere videtur opinioni predicte que philosophica est investigatione non tamen veritate, ideo ad articulum Parisiensem respondere convenit."

Apparently the work was composed after 1323, the date of the canonization of Aquinas, since he is called St. Thomas,[4] although this title might be a later insertion of a copyist. In connexion with the question whether individuals of the same species may differ essentially, allusion is made to an article condemned at Paris which involved the problem whether the soul of Christ was nobler than the soul of Judas. This appears, however, to be a reference to the 124th of the 219 articles condemned by Stephen Tempier, bishop of Paris, in 1277, and so affords little clue to the date of our treatise.[5] On the other hand, the discussion of certain doctrines seems to place our compendium fairly well along in the fourteenth century. Thus, while the conception of the latitude of forms, as indicating their intension or remission, has been traced back to Henry of Ghent (1217–1293),[6] Duhem regarded the phrase, 'uniformiter difformis', which we shall find our author further refining, as introduced by some unknown persons about the time of Albert of Saxony, or the middle of the fourteenth century.[7]

When our author states that the moderns have discarded the definition of *maximum quod non* given by the older philosophers,[8] he evidently is not referring to those of classical times but to two periods of scholasticism, and is already making the distinction which is found from 1425 on in the German universities [9] in the *via antiqua*, meaning the philosophy of the time of Albertus Magnus and Aquinas, and *via moderna*, indicating the teaching of men like Jean Buridan, Marsilius d'Inghen, and their followers.

[4] *Ibid.*, fol. 214r.

[5] The passage itself may be of some importance, however, as indicative of later opinion about the condemnation of 1277 and the particular question involved in the 124th article. I therefore reproduce it (in Appendix II, below).

[6] See Pierre Duhem, *Études sur Léonard de Vinci*, troisième série, *Les précurseurs parisiens de Galilée*, Paris, 1913, p. 319. This work will henceforth be cited as Duhem, II (1913).

[7] *Ibid.*, p. 309: "Bientôt, on vit apparaître un vocable dont il nous serait impossible de nommer l'inventeur . . . *uniformiter difformis*. Nous trouverons cette expression dans l'usage commun de maîtres de l'École d'Oxford qui furent contemporains d'Albert de Saxe ou qui furent même plus anciens que lui."

[8] See below, note 44.

[9] Gerhard Ritter, *Studien zur Spätscholastik*, II. *Via antiqua und via moderna auf den deutschen Universitäten des XV. Jahrhunderts*, Heidelberg, 1922, especially page 39.

Primarily our work is an exposition of the philosophy of Aristotle, and serves to emphasize his great influence on later mediaeval thought and science. But it manifests a different attitude towards Aristotle from that when the *Metaphysics* and the works of natural philosophy were first introduced at Paris and elsewhere, or from that when Albertus Magnus and Thomas Aquinas commented upon or paraphrased, expounded and pieced out, the known writings of Aristotle, and reconciled them as best they might with the Christian faith. Where Albert had expounded and amplified the extant Peripatetic body of fact and theory, our author would boil it down and simplify it for the benefit of students. "Because the text of Aristotle by its too great prolixity and the difficulty of its wording often uselessly retards youth in the prosecution of their studies and detains them overlong, therefore it has seemed fitting to collect in summary fashion the opinions of Aristotle himself and of other philosophers so that those matters which were previously drawn out may be readily comprehended under the form of a brief compendium." [10]

Our work is more than a mere abbreviation, however. Two other considerations have moved the author: first, that many passages in Aristotle's works are in contradiction to religious dogmas; second, that many persons in philosophy in modern times treat of matters of which Aristotle wrote little or nothing. Thus the history of modern philosophy has begun for our author. He believes that this new thinking should be included, and also some other points of which he has found slight or no mention elsewhere. He therefore lays claim to a certain amount of originality as well as modernity. Instead of adding to the Peripatetic philosophy a further body of fact in essential harmony with it, as Albertus Magnus had done, he interlards it with various recent theories of a different sort. Moral philosophy is left for a separate treatise, and is not treated in our manuscript.

The scope of the six books of our compendium is briefly as follows. The first, after discussing the character of metaphysics

[10] BN 6752, fol. 4r, the *Praefatio* opens: "Quia textus Aristotelis nimia prolixitate verborumque difficultate sepius inutili iuvenum proficientium studia retardent temporaque detinent nimium, ideo congruum apparet ipsius Aristotelis aliorumque philosophorum sententias summatim colligere ut sub brevi compendio que prius extensa erant facilius comprehendantur."

and of natural philosophy, treats of universals and individuality. The second deals with form and matter, but especially with the subject, so much discussed in the fourteenth and fifteenth centuries, of the latitude of forms. The third book, covering the ground of Aristotle's *De anima* and such related treatises as *De somno et vigilia* and *De memoria et reminiscentia*, takes up the soul, senses, substantial forms, ideas and species. The fourth has to do with transmutation and motion, and somewhat corresponds to Aristotle's *Physics* and *De generatione et corruptione*. Book five treats of the earth, of the animals upon it, including man and the pseudo-science of physiognomy, of metals and minerals, winds and waters, and varied meteorological phenomena. The last book leads us through the spheres to the Intelligences and First Cause. On the whole, as will become more apparent upon examination of the full table of contents by chapter-headings (reproduced in Appendix I, below), the work is economically arranged and skilfully put together, blending the various subjects treated of by Aristotle and a large amount of more recent discussion and theorizing into a reasonably well-knit whole. It is a better synthesis than such earlier compilations as Alexander Neckam's *De naturis rerum*, Thomas of Cantimpré's *De natura rerum*, Bartholomew of England's *De proprietatibus rerum*, or Vincent of Beauvais' *Speculum naturale*.

Some illustrations may be offered of our author's readiness to disagree with Aristotle. Having mentioned the view of certain persons that the perfection of anything should be judged according to its approach to or recession from the first being, which is God, he adds that this argument would not be conclusive against the followers of Aristotle because they would say that God was of finite vigor and hence of finite perfection. "In this nevertheless they would err." [11] In another passage Aristotle's definition of place or space is criticized as too metaphysical and mathematical.[12] In a third passage our author grants that Aristotle did not use the word 'qualification', but holds that it is necessary to use it if we would have a general name for transmutation of quality made in the present.[13] On a fourth occasion he contends

[11] BN 6752, fol. 36r.
[12] *Ibid.*, fols. 146v–147r.
[13] *Ibid.*, fol. 117r.

that intension of forms is not caused by getting rid of contraries, though Aristotle and his Commentator may seem to have said so.[14]

Albertus Magnus is used extensively for the natural science of our treatise, especially for the discussion of metals and gems, where there was no Aristotelian work to follow. Albert's work on minerals is therefore excerpted practically verbatim, including its references and citations.[15] In other connexions, however, our author sometimes disagrees with Albertus, opposing his arguments for the existence of Antipodes, for instance. Our work embodies not a little from Arabic astronomy, such as the theory of Thebit ben Corat of access and recess of the eighth sphere,[16] or the attempt of Alpetragi, in his treatise on the sphere opening "Revelabo tibi secretum pectoris . . .", to explain all irregularities of the orbits of the planets by mere differences of movements.[17] Use is made of such a post-Aristotelian and Platonic work as the *De deo Socratis* of Apuleius, and such a representative work of the earlier scholastic period as the *Sex principia*[18] of Gilbert de la Porrée, who died in 1154.

While recent writers are not cited by name individually, their views are often referred to collectively. Sometimes our author approves of them, as when, discussing the proper subject of natural philosophy, after two other opinions he presents that "of

[14] *Ibid.*, fol. 128r (lib. IV, cap. 24). See also fol. 120r (IV, 19), "Aristoteles tercio Topicorum innuere videtur quod intensio qualitatis fieri habet per depurationem a contrario . . ."; and fol. 123r, where we are told that this is false, "ut deducunt aliqui moderni".

[15] Compare BN 6752, fol. 170r, with Albertus, *Mineralium* III, i, 4; fol. 171r with *Mineralium* III, i, 7–8; fol. 172r with *Mineralium* I, 13; fol. 172v with *Mineralium* I, i, 6; fol. 173v, on Avicenna's explanation of fossils, with *Mineralium* I, ii, 9; fols 173v–174r with *Mineralium* II, 2; etc.

[16] BN 6752, fol. 171: "Thebit astrologus in suo tractatu de accessu et recessu octave spere negat motum primi mobilis super polis zodiaci compleri, imo imaginatur duos parvos circulos, unum in capite arietis et alium in capite libre, secundum quos dicit octavam speram moveri aliquando procedendo et aliquando retrogradiendo, ut predictum est. Nec oportebat secundum istam imaginationem res corruptas renovari. . . . Poli mundi moventur circa polos zodiaci et poli zodiaci moventur circa polos mundi. Et quia motus sunt valde differentes videtur igitur quod polorum distantia mutetur quia impossibile est aliqua duo semper equaliter distare quando quodlibet eorum continue movetur motu dissimili secundum velocitatem et tarditatem."

[17] *Ibid.*, fol. 17v.

[18] *Ibid.*, fol. 128r.

the moderns who hold that this whole moving universe is the adequate subject of natural philosophy, which opinion seems to be true".[19] On other occasions he speaks disapprovingly of the inept or undigested subtlety of certain moderns.[20] Many moderns have thought that the perfection of anything arose from replication of the first degree of being or of the same degree, but this our author denies.[21] He does not hesitate to disagree even with doctors of theology, at least when they enter the field of philosophy. Some of them, "in this thinking to philosophize", said that the infinite can be produced. Their arguments are at first sight formidable, but it seems to our author that their opinion does not contain the truth.[22] The very subtlety, however, of the opinions with which our author disagrees reinforces our impression that he is writing well along in the fourteenth century.

An opinion of which our author believes that he has disposed or of which he heartily disapproves is commonly branded as false by him. Another milder term which he sometimes applies, *voluntaria*, is unfamiliar to me. It does not seem to mean quite the same as 'optional', but to imply a certain amount of condemnation on his part.[23] Possibly 'wilful' would be a fair translation for it.

Our author denies that matter is the cause of the multiplicity of individuals [24] in the same species, holding that the matter of one

[19] BN 6752, fol. 7v, "Insuper tertia est opinio modernorum ponentium quod hoc totum ens mobile est subiectum adequatum philosophie naturalis que opinio videtur vera."

[20] *Ibid.*, fol. 17v, "De quorundam inepta subtilitate . . ."; fol. 84r, "De quorundam modernorum indiggesta subtilitate . . ."; fol. 127r, "De quorundam modernorum inepta subtilitate in eadem materia."

[21] *Ibid.*, fols. 37r–38v.

[22] *Ibid.*, fol. 140r; "Et de hoc inquirentes aliqui doctores theologi in hoc credentes philosophari dixerunt infinitum posse produci." Fol. 140v, "Unde licet eorum argumenta prima facie difficilia videantur, mihi tamen apparet quod eorum opinio non continet veritatem."

[23] Thus at fol. 95v, after arguing that those who suppose a third factor in the composite besides matter and form make an unnecessary and superfluous assumption, since form and matter suffice to explain everything, he concludes that "predictam opinionem fore voluntariam". In his closing sentence at fol. 235v he says that to correct one's mistaken views "laudabilius est quam favorabiliter opinionem falsam licet voluntariam tueri".

[24] BN 6752, fols. 11v–12r; "causa plurificationis individuorum".

individual is of the same character as that of another.[25] Matter is therefore not the cause of individuality, "but rather individuals are distinguished by themselves and consequently by their essences individually".[26] Moreover, the variety of inferiors depends on the motion of the stars.[27] Since he denies that anything else than matter and form enters into the composite,[28] individuality must result from form, and this depends on the celestial movements. This is further shown when our author follows Albertus Magnus in ascribing the effects produced by precious stones to their substantial forms, and goes on to say that the substantial form is a sort of mean between the celestial influences and the matter which receives form. "Therefore form is caused by the influences, provided matter is found disposed, and according to the disposition of the form operations are introduced." [29]

As has been said already, the latitude of forms receives much attention from our author. Certain moderns had formed the hypothesis that the perfection of any species was of a certain latitude and consequently divisible infinitely.[30] Individuals of that species would all have differing degrees of specific perfection and exceed one another in essential perfection without differing in species. It would also be impossible for several individuals of the same species to be identically perfect. But our author rejects the whole hypothesis as false,[31] although it would seem to have much to commend it. In the second book he returns to a more protracted discussion of latitude. For that of all creatures some have set the two exclusive limits of absolute non-being and of God, while others have posited two inclusive terms, first matter at the bottom of the ladder and supreme Intelligence at the top.[32]

[25] *Idem*, "eiusdem rationis".

[26] *Ibid.*, fol. 12v: "Ex his ergo concluditur quod materia non est causa individuationis seu distinctionis individuorum eiusdem speciei sed potius individua se ipsis et consequenter suis essentiis individualiter distinguuntur."

[27] *Ibid.*, fol. 13r–v.

[28] See note 23.

[29] BN 6752, fol. 174v; "Itaque forma ab influentiis causatur dummodo materia disposita inveniatur et secundum dispositionem forme operationes introducuntur."

[30] For, as is stated at fol. 41v, "quodlibet continuum est infinitum secundum divisionem".

[31] *Ibid.*, fol. 17v.

[32] *Ibid.*, fol. 35r (II, 14).

He raises many questions as to this scale of creatures: whether the supreme degree of being is attainable,[33] how the latitude of creatures is uniformly difform,[34] whether it is continuous or interrupted,[35] and concerning its genera,[36] of which some have distinguished six, others ten or twelve, while certain persons have placed man midway in the series.[37] Our author distinguishes eight: what is potential like first matter, corporal accidents, spiritual accidents, inanimate forms, vegetable forms, sensitive forms, rational forms, and intelligences. The last genus includes angels "and generally anything that understands without phantasy".[38] In the latitude of not-being four degrees of privation are distinguished. Examples of the first are antichrist and Adam, "because they are not, but were or will be". An instance of the second degree is a mountain of gold, which might exist but neither is nor has been. The third degree is represented by the proposition, Man is an ass, which is impossible but can be imagined. But no example of not-being to the fourth degree can be given, since it is not even imaginable.[39]

The subtlety of late medieval scholasticism is further evidenced in the exceedingly fine point to which are developed the distinctions of uniformity and difformity. Thus latitude which is difformly difformly difform is twofold, one variety being uniformly difformly difformly difform, while the other is difformly difformly difformly difform. This last in turn may also be distinguished into its uniform and difform varieties, and so on *ad infinitum*.[40] Our author gives several opinions as to how the intension of forms is produced, including that of the author of the *Sex prin-*

[33] *Ibid.*, fol. 41r (II, 20).

[34] *Ibid.*, fol. 46r (II, 23).

[35] *Ibid.*, II, 24–25.

[36] *Ibid.*, fol. 47v (II, 26).*

[37] *Ibid.*, fol. 48r; "humaneque perfectioni applaudere cupientes quidam in orizonte creabilium hominem constitutum dixerunt ipsum dicentes in medio dicte latitudinis huiusmodi fore constitutum."

[38] *Idem;* "et universaliter quecumque res intelligens sine fantasmate."

[39] BN 6752, fol. 88r.

[40] *Ibid.*, fol. 45v; "Insuper latitudo difformiter difformiter difformis est duplex quia quedam est uniformiter difformiter difformiter difformis, alia vero est difformiter difformiter difformiter difformis, et ita potest distingui de latitudine difformiter difformiter difformiter difformis, et sic in infinitum."

cipia.[41] He does not believe that mean qualities come from the extremes, but since many moderns think so, he will not omit their reasons, so that the reader may form his own opinion.[42]

In connexion with another favorite topic of late scholasticism, that of maximum and minimum, our author introduces a discussion of *maximum quod non* and *minimum quod non*, although he admits that Aristotle never used either expression.[43] The moderns have proved rationally that the definition of *maximum quod non* given by the older philosophers is not valid,[44] but their substitute is prolix and obscure, and our author tries to restate it more clearly.[45] In the case of homogeneous things he is inclined to prefer to use as the lower limit of their latitudes the greatest quantity or intensest quality that they fall short of reaching, rather than the least that they do touch, but he is willing to let the reader follow his own preference.[46] For vision, however, he

[41] *Ibid.*, fol. 128r; "Videre igitur restat qualiter huiusmodi intensio fiat et de hoc multi fuerunt opiniones."

[42] *Ibid.*, fol. 122r *et seq.* (IV, 20).

[43] *Ibid.*, fol. 111v. Duhem, *Études sur Léonard de Vinci, Seconde série*, Paris, 1909—henceforth to be cited as Duhem, II (1909)—page 25 *et seq.*, has noted that Aquinas, in his commentary on *De celo et mundo*, I, 25, said: "De même que l'on détermine la puissance que quelqu'un possède en indiquant le maximum de ce qu'il peut accomplir, de même on détermine ce qui lui est impossible par l'œuvre minimum parmi celles qu'il ne peut accomplir." Jean de Jandun, however, in his commentary on the same work, written before 1323 (Venice, 1574, I, 2; fols. 78–80), held: "Il est vrai qu'à une vertu naturelle donnée correspond un maximum des œuvres qu'elle peut accomplir; il n'est pas vrai qu'il lui corresponde un minimum des œuvres qu'elle ne peut pas accomplir." Albert of Saxony, on the contrary, *Questiones in libros de celo et mundo*, lib. I, quest. xiv, affirmed: "potentia activa non terminatur per maximum in quod sic; terminatur per minimum in quod non." Marsilius d'Inghen also spoke of "maximum in quod non". For Buridan's discussion of the same matter see Duhem, II (1909), 383–384. Richard Suiseth, *Calculationes*, Tractatus decimus de maximo et minimo, edition of 1520, fol. 34r, writes: "Et primo notande sunt significationes terminorum. Ut maximum significat sic, scilicet tantum et non maius: et minimum, aliquantum et non minus. Et maximum quod non, id est non tantum sed omne maius, et minimum quod non, id est non tantum sed omne minus."

[44] *Ibid.*, fol. 109v: "Maximum quod non est illud in quo talis res non potest esse sed in quolibet maiori. Hec autem diffinitio data est ab antiquioribus philosophis, moderni tamen ipsam non valere rationabiliter probant."

[45] *Ibid.*, fol. 110r.

[46] *Ibid.*, fol. 111v: "Ex quibus omnibus concludi potest quod si volumus presentem responsionem tenere, habemus in rebus omogeneis a parte inferiori dare maximum quod non et non minimum quod sic. Eligat tamen lector quam partem voluerit quia utramque probabilem puto."

contends that it is not possible to give a minimum distance at which it will operate, because this could always be divided into smaller portions; but that it is possible to suppose a maximum distance at which it will not operate because it is too small to be seen.[47]

A touching faith in nature is displayed by our author in laying down the following five propositions, derived no doubt from Aristotle:

1. Nothing is idle in nature.
2. Of possible courses nature always does what is best.
3. Nature is the principle of the thing of which it is the nature; art, however, is the principle in another.
4. Nature always acts for some reason or towards some end.
5. Nature rejects infinity and confusion.[48]

Nine similar propositions concerning art are expressly ascribed to Aristotle:

1. The human race lives by art and reason.
2. No art considers the particular because particulars are infinite and unknowable.
3. Science and art come through experience.
4. Invention of the arts was necessary for living well.
5. Artificial operations are deliberative and thereby differ from natural operations.
6. No one of himself can discover speculative or practical arts.
7. Art is better than experience.
8. Art ought to employ organs.
9. If anything can be done without art, much more so by art.[49]

But this last principle our author has just before refused to admit in the case of alchemy, holding that alchemists try to accomplish by art what can be done only by nature.[50]

Some of his opinions in physics are of interest. He holds that local motion cannot be distinguished from the moving object, although some regard it as a flexible and successive accident distinct from the thing moved.[51] Velocity is defined as follows: "That is said to be moved more swiftly which in equal time covers a greater space."[52] He agrees with Aristotle that the heart is the

[47] *Ibid.*, fol. 112v (IV, 14).
[48] *Ibid.*, fol. 100r (IV, 4).
[49] *Ibid.*, fol. 137r.
[50] *Ibid.*, fol. 136v.
[51] *Ibid.*, fols. 144r–146r.
[52] *Ibid.*, fol. 115r; "illud dicitur velocius moveri quod in equali tempore maius spatium describit."

seat of motion in the body,[53] and that "natural motion"—*i.e.* of a falling body—"is swifter in the end than in the beginning".[54] The possibility of perpetual motion is discussed. If we do not experience it in inanimate objects, nevertheless many say that it has been invented artificially. Our author has performed the experiment of keeping a wheel filled with quicksilver rotating by applying heat to the lower part, and understands the reason, that mercury rises with heat.[55] This device is probably the same as that for perpetual motion which Drebbel showed to James I. It does not seem to occur to our author that it might be utilized as a thermometer, or that it is not really perpetual motion. On the other hand, when he inquires whether there can be motion in a vacuum, this does not mean that he entertains the possibility of the existence of a vacuum. But he believes that it sometimes assists the investigation of truth to presuppose the impossible.[56] Something approaching the conception of mass seems involved in the statement that many ancients and moderns distinguish *quantitas continua seu molis* from *res quanta*. Our author, however, rebuts their arguments.[57] Some suggestion of the modern conception of inertia is perhaps discernible in the utterance, "As is the proportion of active power to the resistance, so is that of the lifting force to the weight".[58]

If there were several worlds, would the earth of one be moved towards the center of another? It seems so, because earth tends towards the center. To this it is replied that if the worlds were concentric, the earth of the superior or outer world would tend towards the center of the inferior, but would be detained by violence above the surface of the last sphere of the inferior world. If, however, the worlds had different centers, the earth of each would tend towards its own center.[59] Duhem, without using or knowing of our work and manuscript, has traced the earlier his-

[53] *Ibid.*, fol. 99r.

[54] *Ibid.*, fol. 115r; "motus naturalis velocior est in fine quam in principio."

[55] *Ibid.*, fol. 52r–v.

[56] *Ibid.*, fol. 153r.

[57] *Ibid.*, fol. 133r.

[58] *Ibid.*, fol. 114r; "qualis est proportio potentie active ad resistentiam, talis est potentie levative ad pondus."

[59] *Ibid.*, fol. 163r.

tory of this problem, especially in fourteenth-century thought.[60] It goes back to the Aristotelian argument against the plurality of worlds, that the element earth can have only one natural place, namely, in the center of our world. Jean de Jandun, in his commentary on the *Physics* written soon after 1323, maintained the same position, and opposed the theory that a certain virtue of the natural place attracted the earth, because it would weaken the Aristotelian argument against the plurality of worlds.[61] But William of Ockham, contending in his commentary on the *Sentences* that God could make more than one world, argued that the earth in each world would collect at its own center, and adduced the analogy of fire, which even in our world—if kindled at opposite poles—would move upward in opposite directions.[62] Albert of Saxony, writing probably between 1351 and 1362, denied the natural possibility of several worlds with different centers, but granted that if there were such, the earth in each case would tend towards the center of its own world.[63] Nicholas Oresme, in 1377 in his commentary in French on *De celo et mundo*, defended the possibility of many worlds and held that weights in each world would move towards its center.[64]

St. Thomas Aquinas made local motion the cause of heat, but this is not so when there is no friction of the parts of the thing moved. Thus the iron shaft of a millstone does not grow hot, and, if a heavy body were moved in a vacuum, it would not become heated because there would be no friction from the air. Our author therefore adopts the opinion of Albert that the friction or collision of bodies is the cause of heat.[65] Yet the nature

[60] Duhem, II (1909), 58–96.

[61] Duhem, II (1909), 84; Ioannis de Ianduno, *Super octo libros Aristotelis de physico auditu subtilissime quaestiones*, Venetiis apud Iuntas, 1551, VIII, xi, fol. 116r: "Item, si virtus naturalis loci esset causa effectiva motus gravis, sequitur, si ponerentur plures mundi quod grave secundum naturam suam haberet tantam convenientiam cum medio alterius mundi sicut cum medio huius mundi. . . . Nec istud intendit Arist. sed intendit quod grave illius mundi esset natum moveri ad medium huius mundi: et hoc bene sequeretur cum esset eiusdem rationis cum gravi huius mundi."

[62] Duhem, II (1909), 76–77.

[63] *Ibid.*, p. 82; see also Duhem, I (1906), 34.

[64] Duhem, III (1913), 370–371.

[65] BN 6752, fol. 214r.

of heat was not thoroughly understood until the middle of the nineteenth century.

If earth is heavier than water, why is not the sphere of earth entirely submerged under the sphere of water? Some explain the dry land or habitable earth as a sort of mountain or excrescence, but our author prefers the explanation that the earth's center of gravity is not the same as the center of its circumference. The heavier half of the sphere sinks the deeper below the surface of the water, while a portion of the lighter hemisphere projects out of the water, just as the heavy scale of the balances falls and the lighter rises.[66] This hypothesis of overlapping or intersecting surfaces of earth and water saves the sphericity of the earth, and God was more likely to make a round and perfect than a hump-backed and deformed earth. Moreover, sailors find that the sea grows deeper in parts more remote from the land. And we find by experiment that earth subjected to water is commonly denser and heavier than dry earth. Furthermore, with mathematical instruments it is easy to demonstrate that the earth is spherical except for some mountains which count for little in comparison with its surface as a whole.[67]

This view, that part of the sphere of earth was not covered with water because the center of gravity was not identical with the center of the sphere, was also held in the fourteenth century by Albert of Saxony, Themon Judaeus, and Nicolas Oresme.[68] Our author, however, appears to have offered some arguments for it which we do not find in Duhem's exposition of their views. Of another explanation, current at least since Ristoro d'Arezzo in the thirteenth century, that the dry land was uncovered by the force of the stars which also held the displaced masses of water in check elsewhere,[69] our author says nothing.

One reason why our author opposes the arguments of Albertus Magnus for the existence of Antipodes is that this theory requires

[66] *Ibid.*, fol. 159r–v.

[67] *Ibid.*, fol. 160r; "Item cum instrumentis mathematicis faciliter possumus experiri quod terra semper tendit ad rotunditatem demptis fortassis aliquibus montibus qui respectu totius terre parum debent computari."

[68] Duhem, III (1913), 361–367; also I (1906), 11.

[69] For Ristoro's theory see my *Science and Thought in the Fifteenth Century*, New York, 1929, p. 202.

that more than half of the earth's surface be under water, for the sphere of water exceeds that of earth in diameter and circumference. He grants, however, that habitation is possible under the tropics, because the first clime is only 12 and 3/4 degrees from the equator, while the Tropic of Cancer is 23 degrees and 51 minutes north thereof.[70]

In discussing earthquakes he suggests that the earth might in certain parts be so condensed by the action of water or cold as to displace other parts by its greater weight. Such condensation would take place so gradually as to be imperceptible.[71] This notion of a slow shifting of the earth's crust and interior, which he says is not found in the writings of Aristotle, almost entitles him to be ranked among the forerunners of modern geology—a place, however, which he must share with other fourteenth-century thinkers like Albert of Saxony.[72]

The idea that the earth revolved instead of the sky was also already in men's minds, but is branded as "most false" by our author, who argues that such velocity of the earth would bring buildings down in ruin and would not serve to explain why such planets as the sun and moon are nearer at some times than others, or to explain phenomena like eclipses, conjunctions, and oppositions.[73]

From consideration of terrestrial phenomena our author at the close of the treatise wings his way aloft to the angels, of whom his account seems somewhat novel, at least in terminology. Angels have a twofold cognition, matutinal and vespertine—perhaps analogous to the Pauline "seeing darkly" and "face to face". Morning knowledge is what they have by intuition of the First Cause, in which they know things more directly than in their proper genera, which is the method of evening knowledge. As a very skilful artisan can achieve results with few tools, or a learned man can draw infinite conclusions from one principle, so to a more perfect angel a single species suffices for knowledge of many things. Some persons think that angels have universal

[70] BN 6752, fol. 219v.

[71] *Ibid.*, fol. 160v.

[72] Duhem, III (1913), 361; "En outre, les parties centrales de la terre, au bout de longs siècles, parviendront à la surface"; also p. 366.

[73] BN 6752, fol. 160r.

species or ideas, dating from creation and not derived from things; others hold that they derive their species or ideas from things. Others, taking middle ground, say that they have some universal species and some particular ones. They think that angels from the moment of their creation had universal species of all things, but afterwards received particular species in twilight knowledge from things. As we are first acquainted with particular phenomena and later form universal concepts, so conversely angels first possess universal knowledge and afterwards particularize.[74]

Although our author accepts astrology in large measure, he shows a good deal of scepticism as to occult arts, sciences, and influences. He is, indeed, inclined to ascribe importance to the number eight in the universe, music, and geometry.[75] But at the theory of the *magnus annus* he looks askance. Not only is it against human liberty of action, but, since the moon does not fit into the solar year, it is impossible that after the great year of Plato everything should be the same again.[76] Thus he approaches Oresme's argument from the incommensurability of the celestial movements. He holds the usual orthodox view that the eclipse at the time of the Passion was not natural but universal.[77] He has a chapter on what comets signify. Noting that Seneca spoke of a comet in the time of Nero which was not a sign of any evil, our author objects that it was a sign of great evil since Nero was the worst ruler of those times.[78] Leopold of Austria is cited as quoting Damascenus to the effect that a comet is produced by God to signify the deaths of kings.[79] But, after noting Leopold's list of nine varieties of comets with as many different significations, and his stress upon the sign of the zodiac in which the comet appears, our author adds: "But while all these matters may seem curious, yet in my judgment they are very superstitious."[80] Similarly, after he has finished excerpting Albertus Magnus on the

[74] *Ibid.*, fols. 231v–232v.

[75] BN 6752, fol. 48r–v.

[76] *Ibid.*, fols. 13 and 16r.

[77] *Ibid.*, fols. 226v–227r.

[78] *Ibid.*, fol. 206r.

[79] *Ibid.*, fol. 206v. This citation of Damascenus is common in medieval works on comets.

[80] BN 6752, fol. 207r; "Hec autem omnia licet videantur curiosa, iudicio tamen meo sunt valde superstitiosa."

operations of gems, he qualifies: "But here it should be noted that those things which were said above about stones are to be understood without superstitious credulity, because those which concern divinations and magic arts I believe are superstitious and worthless. Yet because the philosophers and notably Albertus Magnus wrote the aforesaid, therefore I have added them to this work more as a curiosity than for utility." [81] This, however, seems a weak excuse for their inclusion. Our author grants that Aristotle seems to think that some dreams are presages of the future, but for himself doubts if this can be the case with dreams produced by natural causes. For it is not likely that the work of nature should be a presage of works of liberty, *i.e.* of human free will.[82] He does not mean to deny that God or angels may induce prophetic dreams, however.[83] For the same reason of human free will he thinks it rash to judge a man according to the art of physiognomy.[84] The rejection of such beliefs on the sole ground of human freedom of the will cannot, however, be regarded as manifesting a high degree of rational scepticism or criticism. It is rather a moral or theological attitude.

In our fourth book is a curtly hostile reference to alchemy. The alchemists are said to fall into a great delusion, since they think by the heat of fire to produce gold, which can be generated only by the virtue of the sun, and think to produce in the furnace what has to be generated in the bowels of earth. It may be that many say gold has been made by alchemy; so far they have failed to convince our author.[85] In the ninth chapter of the fifth book [86] he again considers at greater length the question "whether by aid of any art one species of metals can be transmuted into another, which the alchemists attest can be done". He regards it, however, as difficult, because the works of nature are secret, nor are the causes of such operations fully known to us. He then details the doctrine of the composition of metals from sulphur and quick-

[81] *Ibid.*, fol. 183r–v.

[82] *Ibid.*, fol. 89v.

[83] *Ibid.*, fol. 90r.

[84] *Ibid.*, fol. 166v.

[85] BN 6752, fol. 136v; ". . . Et licet plures referant per alchimiam aurum factum fuisse, nihilominus mee credulitati pro nunc non occurrit."

[86] *Ibid.*, fols. 168v–170r.

silver. Transmutation of metals may be possible, but if the art of alchemy has any truth he still thinks that it can have no utility, because the labor and time required more than overweigh the profit of the conversion accomplished.[87]

In closing his work our author piously ascribes all the glory to God, by whose aid, not his, it reaches its conclusion. He has written certain things imitating the opinions of Aristotle and other philosophers. He asks the reader to ascribe what is good to God and kindly to correct what is wrong, for he desires no favor except where reason approves. He may express opposite views somewhere else, but sees no harm in changing one's opinions for the better when an argument previously ignored occurs to one. Nor should a man be thought to contradict himself under such circumstances, since it is more praiseworthy to correct oneself than to hold a false opinion.[88]

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APPENDIX I

Contents of the Six Books

Fol. 22r. Capitula primi libri:

Primum capitulum de subiecto metaphysice.
Secundum capitulum de subiecto philosophie naturalis.
Tercium de qualitate utriusque philosophie.
4^{m} an dicte scientie sint propter quid vel quia.
5^{m} ubi agitur que sunt nota nature.
6^{m} qualiter universalia prius vel posterius cognoscuntur.
7^{m} utrum universalia sint ponenda realia ad extra.
8^{m} de differentia individuali penes quid attendatur.
9^{m} de quibusdam opinionibus circa causam individuationis.
10 qualiter sit respondendum ad motivum platonis.
11 qualiter sit respondendum ad 2^{m} motivum eiusdem.

[87] *Ibid.*, fol. 170r: "Unde si ars alchimie aliquid habeat veritatis, credo tamen quod nihil potest habere utilitatis, quia difficultas operis atque tempus requireret ut estimo sumptus maioris ponderis quam foret commoditas conversionis facte."

[88] With this may be compared the attitude of Agostino Nifo in his commentary on Aristotle's *De generatione et corruptione*, as given by Duhem, II (1909), 36–37: ". . . toujours, à ce sujet, je me suis montré hésitant; sans cesse, j'ai varié dans ce que j'ai écrit. . . . À titre donc de solution des difficultés qui se présentent en ce moment à nous, je vais formuler certaines propositions; mais je proteste que je m'exprimerais tout autrement si les circonstances venaient à changer."

12 de ulteriore errore platonis et qualiter sit respondendum rationibus Aristotelis et Boetii.
13 de quorundam inepta difficultate circa distinctionem individualem.
14 in quo consistat ratio diffinitiva individuationis.
15 quomodo intelligenda sit diffinitio individui seu suppositi.

Fol. 50r. Explicit liber secundus cuius capitula sunt hec:

Primum capitulum de principiis rerum naturalium secundum Empedoclem.
2^m ca^m de principiis rerum naturalium secundum Platonem.
3^m ca. de principiis rerum naturalium secundum Anaxagoram et Anaximandrum.
4^m ca. de principiis rerum naturalium secundum Permenidem et Mellissum.
5^m ca. de principiis rerum naturalium secundum Aristotelem et philosophicam veritatem.
6^m ca. de investigatione diffinitiva materie.
7 ca. de rationibus Aristotelis in ponendo materiam.
8 ca. qualiter ponenda sit materia in celestibus et in istis inferioribus.
9 ca. de proprietatibus materie.
10 ca. de quibusdam dubiis circa predicta.
11 ca. de tercio dubio circa eandem materiam.
12 ca. de inquisitione forme.
13 ca. de proprietatibus forme substantialis.

Fol. 50v.

14^m ca. penes quid debeat attendi perfectio formarum.
15 ca. de aliis opinionibus circa eandem difficultatem.
16 ca. an replicatio alicuius gradus essendi augeat perfectionem specificam.
17 ca. qualiter respondendum sit rationi eorum.
18 ca. an independentia dici debeat aliquis gradus perfectionis in latitudini essendi.
19 ca. de quibusdam dubiis circa predicta.
20 ca. an supremus gradus essendi in latitudine creabilium sit producibilis.
21 ca. de quibus [1] motivis et evasionibus opinionis predicte.
22 ca. de varietate latitudinum.
23 ca. quomodo latitudo creabilium est uniformiter difformis.
24 ca. an latitudo creabilium sit continua.
25 ca. an latitudo creabilium est discreta.
26 ca. de genere latitudinis creabilium.
27 ca. de quibusdam dubiis circa predicta.

Fol. 95v. Explicit liber tercius cuius sequuntur capitula:

Primum ca^m de inquisitione anime secundum antiquos.
2^m c. de impugnatione predictorum opinionum.
3^m c. quid sit anima secundam philosophicam veritatem.
4^m c. de perpetuitate anime.
5^m c. de potentiis anime.
6^m c. de sensu visus.
7^m c. de speciebus existentibus in medio.

[1] 'Quibusdam' in text.

Fol. 96r.

8^{m} c. de quibusdam dubiis circa predicta.
9^{m} c. de quibusdam aliis circa eandem materiam.
10 c. de explanatione predictorum.
11 c. de modo causandi visionem.
12 c. de sensu auditus.
13 c. de tribus sensibus s. gustu odoratu et tactu.
14 c. de distinctione potentiarum nonorganicarum ipsius anime.
15 c. de intellectu agente et possibili.
16 c. de proprietatibus intellectus atque conditionibus.
17 c. de proprietatibus anime in generali.
18 c. an in eodem corpore possint simul esse plures forme substantiales.
19 c. de aliis opinionibus circa eandem materiam.
20 c. de ulteriori declaratione predictorum.
21 c. de quantificatione perfectionis specierum ydealium existentium in anima vel extra animam.
22 c. de 2^{o} dubio circa predicta.
23 c. de perfectione essentiali ydearum seu specierum complexarum.
24 c. de aliquibus dubiis circa pretactam materiam.
25 c. de quidditate seu indivisibilitate ydearum complexarum.
26 c. penes quid attenditur perfectio ydearum complexarum.
27 c. de obiecto intellectus quid sit obiectum intellectus.
28 c. de quibusdam dubiis circa predictam materiam.
29 c. de quorundam modernorum indiggesta subtilitate contra predicta.
30 c. de secunda propositione eiusdem opinionis.
31 c. de tercia propositione eiusdem opinionis.
32 c. quid querunt predicte opiniones cum suis rationibus et distinctionibus.
33 c. de somno et vigilia.
34 c. de memoria et reminiscentia.
35 c. de quibusdam documentis circa memoriam.
36 c. de appetitu et voluntate.
37 c. de quibusdam dubiis et opinionibus circa predicta.
38 c. de complexione anime et cuiuslibet forme substantialis.

Fol. 158r. Explicit quartus liber cuius hec sunt capitula:

Primum capitulum de speciebus transmutationibus (sic) in generali.
2^{m} ca. de quibusdam veritatibus transmutationum in generali.
3^{m} c. de quibusdam aliis veritatibus.
4^{m} c. de quibusdam veritatibus de natura que est principium motus.
5 c. de transmutatione que fit ad substantiam.
6 c. de quibusdam veritatibus Aristotelis de generatione et corruptione.
7 c. qualiter respondendum sit predictis rationibus.
8 c. de quibusdam aliis veritatibus.
9 c. de mensura seu duratione generationis et corruptionis.
10 c. de quibusdam aliis propositionibus in eadem materia.
11 c. de aliis propositionibus in eadem materia (Supplied from text, fol. 108r).
12 c. de limitatione rerum atque transmutationum secundum maximum et minimum.

13 c. de quibusdam propositionibus circa maximum et minimum et primo de rebus homogeneis et etherogeneis.

14 c. de potentia visiva qualiter terminetur respectu distantie atque effectuum seu velocitatis in agendo.[1]

15 is omitted here.

16 c. qualiter potentia passiva terminatur seu in quelibet res secundum durationem.

17 c. de motu seu transmutatione ad qualitatem.

18 c. de contrarietatibus et oppositionibus.

19 c. qualiter contraria possint esse simul in eodem subiecto et utrum qualitates medie constent ex extremis.

20 c. quid sit tenendum circa predictam materiam.

21 c. de quibusdam dubiis circa predicta.

Fol. 158v.

22 c. de quibusdam aliis dubiis circa eandem materiam.

23 c. de quorundam modernorum inepta subtilitate in eadem materia.

24 c. de gradibus intensivis formarum secundum aliquas opiniones.

25 c. de gradibus intensivis formarum secundum veritatem.

26 c. de quibusdam dubiis circa predicta.

27. de motu ad quietem.

28. quid realiter sit quantitas continua.

29. de quadam alia opinione.

30. de partibus ad quantitatem sicut de puncto et consimilibus.

31. de arte et figuris artificialibus.

32. de corpore et suis dimensionibus.

33. de infinito et eius acceptionibus.

34. an infinitum sit producibile.

35. de impugnatione predicte opinionis.

36. qualiter respondendum sit rationibus.

37. de motu secundum locum.

38. de loco diffinitive et quantificatione motus localis.

39. de quibusdam proprietatibus loci ac quibusdam dubiis.

40. de dubiis circa eandem materiam.

41. de vacuo quid sit et utrum possit esse.

42. an in vacuo possit esse motus.

43. de tempore et motu secundum durationem.

44. de quibusdam aliis mensuris s. evo eterno et de instanti.

45. de actione et passione.

Fol. 212v. Explicit liber sextus (*quintus*) cuius sequitur capitula:

Primum capitulum de figura terre.

2^{m} ca^{m} de motu terre et quibusdam aliis dubiis.

3^{m} ca^{m} de quibusdam aliis dubiis in eadem materia.

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[1] This heading for Cap. 14 seems to be a fusion of two headings in the text where we read, fol. 112v, "De potentia visiva qualiter terminetur respectu distantie et de potentia activa respectu distantie"; fol. 114r, cap. 15, "de potentia activa respectu distantie atque effectuum seu velocitatis in agendo."

4^{m} c. de animalibus et partibus eorundem.
5^{m} c. de quibusdam aliis propositionibus in eadem materia.
6^{m} c. de homine et quibusdam incidentibus atque sibi pertinentibus.
7^{m} c. de phisonomia.
8^{m} c. de quibusdam aliis propositionibus magis in speciali.
9^{m} c. de metallis et de sulphure et argento vivo ex quibus generantur.
10 c. de materia metallorum secundum multiplices opiniones.
11 c. de forma substantiali metallorum et transmutatione secundum philosophos et alchimistas atque de loco generationis eorum.

Fol. 213r.

12 c. de generatione lapidis.
13 c. de quibusdam proprietatibus et passionibus lapidum et operationibus eorundem.
14 c. de imaginibus repertis in lapidibus.
15 c. de suspensionibus et coloribus atque quibusdam incidentibus lapidum.
16 c. de lapidibus in speciali secundum ordinem alphabeti et primo de iis quorum nomina incipiunt per a. b. c.
17 c. de lapidibus quorum nomina incipiunt per d. e. f. g.
18 c. de lapidibus quorum nomina incipiunt per has litteras i. k. l. m. n.
19 c. de lapidibus quorum nomina incipiunt ab his litteris o. p. q. r. s. t. u. z.
20 c. de ventis et causis eorum.
21 c. de exalationibus et vaporibus.
22 c. de quibusdam dubiis circa materiam ventorum et de varietate ipsorum.
23 c. de quibusdam opinionibus pretermissis circa motum terre.
24 c. de fontibus et fluminibus.
25 c. de mari et quibusdam incidentibus.
26 c. de salsedine et dulcedine aquarum.
27 c. de stagnis et figura maris.
28 c. de quibusdam aliis dubiis et veritatibus circa naturam aquarum.
29 c. de pluvia et causis eius.
30 c. de signis pluviarum.
31 c. de quibusdam aliis signis pluvie.
32 c. de rore prima et nive atque caligine.
33 c. de grandine.
34 c. de yride.
35 c. de halone et de virgis perpendicularibus atque parelio.
36 c. de cometa.
37 c. de iis que comete signant (or *significent* as in the text).
38 c. de galaxia que alio nomine dicitur via lactea.
39 c. de hiatibus <?>et voraginibus et de tiphone atque etnesia.
40 c. de tonitruo coruscatione fulgure et fulmine.
41 c. de effectibus fulminis et quibusdam aliis impressionibus metheorologicis.

Fol. 235v. (Sixth and last book.)

Primum ca^{m} de speris et planetis in generali.
2^{m} c. de spera et equinoctiali atque zodiaco.
3^{m} c. de coluris meridiano et orizonte aliisque circulis.

Fol. 236r.

4m c. de diversitate plagarum locorum atque climatum.
5m c. de differentia et diversitate locorum.
6m c. de motibus corporum celestium in generali et de mensuris inde acceptis.
7 c. de qualitate signorum aliisque mensuris temporis.
8 c. de eclypsibus et quibusdam circulis planetarum.
9 c. de ortu et occasu signorum et quantitate dierum.
10 c. de intelligentiis.
11 c. de causis et concatenatione ipsarum.
12 c. de prima causa et sui perfectione.

Appendix II

The Article of Paris Concerning the Soul of Christ and the Soul of Judas

(from BN 6752, fols. 46r–46v)

Our author introduces the matter on fol. 46r by saying, "Nam aliqui crediderunt quod in latitudine creabilium species quelibet haberet certam latitudinem intensivam in qua latitudine omnia individua existentia dicuntur esse eiusdem speciei". The individuals of the species would then differ *specifice* but not *essentialiter*. Our author states that his first book has already made the falsity of this opinion clear. He then proceeds (fol. 46v):

Verum est tamen quod isti suam opinionem muniant articulo parisiensi quo dicitur quod anima Christi in essentialibus perfectior est anima Iude, certum est tamen quod predicte due anime fuerunt eiusdem speciei, si ergo essentialiter se mutuo excedunt, igitur in eadem specie reperitur excessus essentialis.

Et licet articulum Parisiensem investigare sit potius catholicum quam philosophicum, quia tamen articulus favere videtur opinioni predicte que philosophica est investigatione, non tamen veritate, ideo ad articulum parisiensem respondere convenit. Dicendum ergo quod ille articulus condemnatus est non tanquam falsus sed tamquam scandalosus. Nam comparare animam Iude anime Christi hoc est comparare pessimum optimo quod penes Deum facere non congruit.

Vel aliter dicitur quod per essentialia anime Christi non solum intelligitur perfectio naturalis ipsius anime, imo etiam intelliguntur perfectiones et gratie collate animi Christi que ideo dici possunt quodammodo essentiales anime Christi eo quod fuerunt sibi coeve et ab ea numquam separate, imo in tantum sibi radicate quod sibi tanquam connaturales adherebant. In talibus igitur anima Christi excessit animam Iude, et si talia dicantur essentialia large accipiendo, ut predictum est, tunc articulus remanebit verus non obstante falsitate predicte opinionis.

Insuper aliter dici potest quod predicte gratie, licet non essent essentiales anime Christi in quantum erat anima, erant tamen sibi essentiales in quantum erat anima Christi quia impossibile fuit ipsa existente anima Christi non habere multas gratias quas habuit.

Item aliter dici potest quod predictus articulus inconsulte seu minus diggeste fuit damnatus. Hanc tamen responsionem dare non auderem nisi in doctoribus solemnibus etiam parisiensibus simile legissem sicut in Egidio et Henrico de Gandavo. Credo tamen melius esse in predictis responsionibus sistere quia presens responsio presumptione suspecta est.

The article of Paris to which reference is made seems to be the following:

Chartularium Univ. Paris., I (1889), 550.

124. Quod inconveniens est ponere aliquos intellectus nobiliores aliis; quia cum ista diversitas non possit esse a parte corporum, oportet quod sit a parte intelligentiarum; et sic anime nobiles et ignobiles essent necessario diversarum specierum, sicut intelligentie.—Error, quia sic anima Christi non esset nobilior anima Iude.

Such words as 'essential', 'in essentials', and 'essentially', do not appear in this article itself as they did in our author's discussion of it. But there appears to be a relation to the debate between Aquinas and Egidius Romanus whether a quality is more or less perfect in its essence, or whether its intensity is a matter of existence (*esse*), that is, of its more or less complete realization in different individuals.[1] Henry of Ghent, who in his *Quotlibeta* confesses that he was one of those who condemned the 219 opinions in 1277,[2] agreed with Aquinas that forms in their essence possessed a certain latitude.[3] There would therefore seem to be no ground for the notion, although it prevailed already at the beginning of the fourteenth century, that the 124th article of 1277 was one of those censuring Thomist opinions.[4] It is also difficult to understand how our author can represent Henry as disapproving of the condemnation. Egidius and Godofredus de Fontibus, however, are known to have criticized it.[5] At any rate in 1325

[1] Duhem, III (1913), 318 *et seq.*

[2] *Quodlib.* 2, q. 9; 8, q. 1; cited by Du Plessis d'Argentré, *Collectio judiciorum de novis erroribus*, I (1755), 213.

[3] Duhem, III (1913), 319: "En ce débat, Henri de Gand (1217–1293) se range nettement au parti de Saint Thomas d'Aquin: 'L'*intensio* et la *remissio* des formes', dit-il, 'se doivent produire en leur essence et par leur nature même, car en leur essence même, elles possèdent une certaine latitude (*latitudo*).'"

[4] Iohannes de Napoli, *Quolibeto*, II, qu. ult.; cited by *Chartularium Univ. Paris.*, I, 556.

[5] Du Plessis d'Argentré, *op. cit.*, especially p. 214, col. 2, where is given Godfrey's quotation of the 124th article. Godfrey also, like John of Naples, states that these articles were held to reflect upon Aquinas: *Ibid.*, 215, "Sunt etiam in detrimentum non modicum doctrinae studentibus perutilis recentissimi et excellentissimi doctoris, scilicet fratris Thomae, quae ex predictis articulis minus iuste aliqualiter diffamatur;

the condemnation of 1277 was annulled in so far as it touched or might seem to touch the doctrine of Aquinas, who had been canonized two years before. This might seem to leave the 124th article open to discussion, and, since our author does not feel quite free to do so, might tend to induce us to put his writing before 1325. But other features of the treatise seem to call for a date subsequent to that.

quia articuli suprapositi et quamplures alii videntur sumpti esse ex iis quae tantus doctor scripsit in doctrina tam utili et solemni."

SOME DESCRIPTIVE PROPERTIES OF RELATIONS

I. Mutual Aid among Relations

FOR the last four hundred years, since the time of Leonardo da Vinci and Galilei, we have been eagerly and rapidly learning how to produce conditions favorable for observation with eyes and ears. We call it physical experiment. By means of skilfully arranged individual situations experimental sciences are able to read information concerning laws and forces which are of universal significance. It is time to realize that observation is not confined to those things which can be seen and touched. A mathematician who establishes a new proposition in the theory of numbers often does this by carefully observing the behavior of certain numbers. The fact that every integer can be represented as a sum of four squares had been observed long before Lagrange gave a general proof of it. Gauss originally discovered the law of reciprocity for quadratic residues by induction, and he testifies that the general proof long evaded his most strenuous efforts, causing him much distress. The history of mathematics is full of illustrations of this sort. A careful observation of abstract situations in mathematics not merely helps, but seems to be a necessary preliminary for a successful research.

We propose to apply observation and description to the study of metaphysics. Before venturing to offer a general method for such a procedure we propose to approach descriptively some specific problem of general metaphysics, and try to show how much can be done in this specific field by suspending all philosophical theories as to the idealistic, realistic, pragmatic, or neutral character of the situations concerned, and confining ourselves exclusively to description. What is here meant by description will become clear in the process of work. We here propose to treat descriptively the problem of relation.

Master and slave. The slave works for his master. He belongs to his master. He is eventually punished by him. Whatever he does as a slave (not as a man in general) he does with regard to his

master. Even if he revolts, it is against his master. In the slave's world, therefore, it is not he himself, the slave, but the master, who is primarily in view; who is the persistent object of fear, of devotion, of attention, of hatred, and what not. The situation of slavery from the slave's point of view lies in the master. If only he could get rid of his master, he would cease to be slave.

The master is in an analogous position. He owns his slaves. He provides for them. He derives his living from them. He can even liberate them. But whatever he does as a master, he does with regard to his slaves. He is always confronted with his slaves, and not with himself. In his world slaves are the persistent objects toward which he at various times is obliged to take different attitudes.

Socially, the master constitutes the power that binds and drives the slaves. Where is this power descriptively located? I do not mean—at least at this stage of the argument—, in whom is it vested; but where does it manifest itself, *i.e.* what are the empirically observable facts and events that reveal the power of the master? Let us observe the behavior of the master himself. That he has power is not an observable fact. But that he consumes the products of the slave's work may be observed and objectively described as a set of activities in his life. He eats what the slave has prepared for him, he trades the excess of his slave's work, he submits to be helped by the slaves. But in all these activities he reveals, not his own power, but that of his slaves, in so far as he merely receives what *they* do for him. Yet he also commands them. And it may seem that it is precisely in this capacity of commanding that his power is manifested. However, commanding, as a series of specific gestures, words, and actions, is not in itself a manifestation of power. For the same gestures may prove precisely a lack of power if they are not followed by the act of obedience on the part of the slave. Thus the behavior of the master never manifests the power vested in him. It is only through the act of obedience on the part of the slave that the master's power is revealed. And this act can be observed directly only in the behavior of the slave. It is in the character and organization of the slaves' work that the power of

their master is manifested. Hence what the word 'master' means is a power among slaves.

On the other hand, what slavery means for the slave is an institution or an organized force that exists among masters. For, of course, slavery does not exist among slaves. For them it is an external force, an abominable machinery supported and financed by the state, which keeps them in subjugation. Thus what the word 'slave' means is a power or organization among masters.

It is this descriptive situation, no doubt, that lies at the basis of Hegel's dialectical remarks concerning slavery. The dialectical phraseology presents the situation in a deliberately paradoxical fashion by saying that master *is* slave—for he is a slave of his own slaves, an economically helpless creature that depends entirely on the work of others—, and slave *is* master, for similarly obvious reasons. Now this s misleading, and, at least descriptively, incorrect. For the master, even though he exists only as a power among slaves, is nevertheless fundamentally different from what they are. The germ of truth obviously contained in Hegel's dialectical discussion of slavery lies in the descriptive situation presented above. This situation does not warrant the assertion that the two terms involved in the relation are identical. Master *is not* slave. But in his world he is constantly confronted with slaves, and not with himself.

Moreover, it is, I think, safe to assume that the average slave-owner had a very vague conception of the nature and limitations of his power. History supplies numerous illustrations of a highly deplorable ignorance on the part of the slave-owners (masters) with regard to what slave-ownership really means. The wealthy Roman landowner was scarcely conscious of the fact that precisely in his capacity as master he was undermining the strength of the Empire, and was directly responsible for the ascent of the dangerous proletariat that finally wrought the ruin of Rome. He knew fairly well what slaves economically and otherwise meant for him. But he certainly was unaware what he meant for his slaves, for the rest of the society, or even for himself.

Thus history corroborates our original assumption concerning the master's difficulties in defining his own nature. He does not face, and therefore does not easily 'see', himself. In his world he

finds slaves in the foreground, and himself as a constantly present, yet but vaguely defined, background. His own image or concept is farther removed from his immediate practical view than that of his precious slaves. His own social, political, and logical physiognomy is obscured, and in a sense obstructed, by the immediate evidence of his counterpart. Thus in his own world he is found as facing his slaves and hiding himself.

Right and left. Right runs against left. Moving to the right upon a straight line or a circle a point A encounters other points which are all in relative motion to the left with respect to A's direction. If we choose A as a zero point of orientation, then all points to the right of it have left orientation, and all points to the left have right orientation. We express this by saying that right *faces* left. It has its orientation in the left. Moreover, it lies to the left from the left. For by turning twice to the left we shall have on our left what was formerly on our right. In the logical self-determination of the right, therefore, left is the constant factor of reference.

It will be well to recall that right is not identical with all the points, or objects, to the right from A. It is not a domain of points, but—figuratively speaking—a way of looking at those points from some definite position of an asymmetrical observer.[1] This 'way of looking' is not an intrinsic property of the points, nor does it exist among them.[2] It cannot be found to the right

[1] If we were symmetrically built, *i.e.* if we felt no distinction between right and left hand, and were supplied with a pair of eyes in the back, etc., we should not be able to distinguish between right and left as permanently fixed directions. This asymmetry constitutes one of the tacit assumptions of that branch of mathematics which studies the behavior of directed magnitudes, the theory of vectors. We read in Appell's *Traité de mécanique rationelle:* "Soit un axe D sur lequel on a choisi un sens positif, de z' vers z par exemple; un mobile M, décrivant une courbe C dans l'espace, tourne autour de l'axe dans le sens positif quand un observateur, *ayant les pieds en z' et la tête en z*, voit le mobile tourner de sa gauche vers sa droit." Thus to be able to distinguish between right and left we must have, not merely two different hands, but also a head and a pair of legs.

[2] This statement should not be misconstrued as implying an endorsement of Kant's transcendental idealism. One may not be idealistically inclined, and yet admit that orientation is not a property of the points. Eddington (*Mathematical Theory of Relativity*, p. 9) writes, for instance: "If we describe the points of a plane figure by their rectangular coördinates x, y, the description of the figure is complete, and would enable any one to construct it; but it is also more than complete, because it specifies an arbitrary element, the orientation, which is irrelevant to the intrinsic properties of the figure."

from A. Where is it located? In the observer, to be sure. But this kind of 'in' is not a descriptive property of the relation in question. We wish to describe a geometrical property, whereas 'in the observer' is not a geometrical, but an epistemological, relation. Where is that 'look' located, not epistemologically, but descriptively, in terms of the situation here empirically given? Where does it come from in terms of geometrical orientation along the line? It seems that only one answer is descriptively conceivable: the look comes from the left. And, indeed, the point of reference, A, which represents our observer upon the line, the point from which the look goes, is actually situated 'in' the left with respect to all the points located to the right of A. Thus the right direction may be properly described as a 'look from the left'.

This is not a matter of subjective definition. What we have (figuratively) described as a look is an objective phenomenon, something that exists in nature, in Being, and not only in consciousness. If the relation be wholly depersonalized and every reference to an asymmetrical observer eliminated, the distinction between right and left will be reduced to a purely mathematical difference in sign—plus and minus, which are entirely relative and interchangeable, and yet irrevocably different. Perhaps it is better to call them (with Russell) "rays" instead of 'looks'. No less a person than Gauss points out that the difference between right and left is in itself wholly determined, *i.e.* if in a plane definite directions be arbitrarily asigned to 'in front' and 'behind', and if with respect to the same plane the positions of 'up' and 'down' be chosen, the remaining two directions are uniquely determined.[3] The distinction is objective, and cannot be wholly explained as an effect of our asymmetrical organization. For in order to build us asymmetrically nature itself must have employed the two directions as distinct. If they had not been objectively distinct we could not possibly exist as asymmetrical creatures. This in brief is the essence of Kant's argument in favor of the objective character of the right-left relation. In his *Von dem ersten Grunde des Unterschiedes der Gegenden im Raume* he argues that nature itself makes the distinction permanent

[3] Gauss, *Theoria Residuorum Biquadraticorum* (*Werke*, II, p. 177).

by regularly arranging certain biological forms in a uniquely asymmetrical manner.

And yet the two directions, however distinct, are determined only with reference to each other. In traffic we must keep to the right. But is it the right direction that we are primarily conscious of as we travel? Do we watch the machines on our right? Certainly not primarily. We are aware of our righthand fellow-travellers only when we have to pass by one of them, and in doing so we must keep to the left. This is a very significant detail. As soon as we become aware of our own side in the traffic we are obliged to behave like those who are on the left. Moreover, as drivers we are very inadequately conscious of our own motion. It is the cars travelling in the opposite direction, *i.e.* the left-hand ones, that we have to watch, and the collision with which we are trying to avoid by keeping to the right. It is precisely the left direction that dominates our consciousness. The right is only a vaguely felt background. What is clearly seen and watched for, and feared, is the left direction.

Relation as operation. What can be derived from the above illustrations with regard to the nature of relation as such? First of all we may observe that each of the two terms involved in relation *does* something with respect to the other term, or to the outside world. Right runs against left, or faces left. As a direction it lies somewhere, namely, to the left, from the left, etc. Its substance is expressed by a verb, not by a noun. In this sense it is an operation, not an entity. It reveals itself, *i.e.* defines its own field or sphere, by doing something. The master owns his slaves. The slaves belong to their master. Right runs against left. Left lies to the right from the right. Just what each term actually does constitutes its *genuine sphere* as distinct from its logical, psychological, ethical, perhaps physical, spheres, which determine its nature as a logical, psychological, perhaps physical entity. With respect to the genuine sphere the philosophical distinctions of subjective and objective, mind and matter, reality and neutrality, are wholly irrelevant.

Relation, therefore, is not a coëxistence of two entities, but a coöperation of two genuine spheres. Of course, we do not deny that every relation is something. It may exist or subsist in many

different spheres. It may be variously interpreted as a neutral entity, or a function of mind, as an idea or a mere word, as an instrument of action or a configuration of atoms in my head. Yet all this variety of philosophic interpretations does not affect the genuine output of the relation as operation. It will always do what it does regardless of whether it is philosophically considered as a function of mind or a neutral entity, *i.e.* regardless of whether we choose the idealistic or the realistic position to explain its nature.

But if such a radical change in philosophic interpretation does not affect the structure of relation, if it is possible for us to regard relation at one time as a neutral entity, and at another time as an instrument of action, or even as a mere symbol, —then there must be something in it that lies above and beyond any and all of these interpretative features; something that every relation does regardless of whether it is an entity or an activity, a configuration of atoms or a category. This something that is left behind when we suspend all philosophic theories concerning the essence of relation, this empirical residuum that enables us to understand what relation does independently from any metaphysical or epistemological interpretation, is what we have in mind when we speak of relation as operation.

Relation described as facing a situation. The ideas expressed in the preceding paragraph may at once receive a concrete application. 'The master owns his slaves.' Owns—that is what the master does regardless of whether this owning is a function or a substance, a sensation or a neutral entity. Neither sensations nor neutral entities own each other. The relation of ownership does not apply to logical terms. No matter what they are, they are not what the master is in his own genuine sphere. A term in logic means what it never means in its actual performance —a unit of denotation mysteriously tied to another unit by means of a medium vaguely called relation. Relation is there conceived as an entity which implies its terms (*per modum inhaerentis*). Descriptively, however, *i.e.* in its own genuine sphere, every relation does something definite and very specific (*per modum ad aliud se habentis*) beside implying or being implied. The master owns, the slaves belong, etc. Now let us consider the situation

in its general aspect. For master substitute the symbol p, and for slave the symbol q. Then the word 'owns' must also be replaced with something else. We are accustomed to call this something relation. Our phrase becomes 'p is related to q'. What are p and q doing in this situation?

The minimum of what is given to us distinctly in every relational situation is a certain coördinated behavior of its terms, p and q. A thing that is larger than another behaves mathematically in a certain manner with respect to that which is smaller. A creature that has wings must satisfy the conditions necessary for the existence and functioning of wings. In other words, every relative term has to fit the frame provided for it by its relative companion. If relative terms could speak they would describe themselves primarily as *facing certain situations* defined, not in their own elements, but in the elements of their respective associates. We shall express this by saying that every relative term is a 'face' confronted with a 'field' in which it is operative. An important corollary to this is that no term is operative in its own field. Thus slave is the relative field of master; it is master who operates in this field, not slave. By exploring the field we become acquainted with the face (*ex filio enim pater cognoscitur*).

Face. Face implies direction, not necessarily in a physical or geometrical sense, but in the sense of a definite course of operation, or progressive determination. Moreover, it uniquely defines a direction which for every possible observer remains always the same. For facing something implies a definite and intrinsically irreversible operation in the direction away from. . . . This is what we call the *specific deflection* of logical energy in relation, as distinct from the *imaginary deflection* to be discussed later on. A cube has six faces. This means that by a geometrical operation perpendiculars can be erected from the cube in six different directions. A commodity has a face-value. This means that a definite amount of utility can be derived from it.

Face is not originally a geometrical notion. It is a prerequisite of every geometry, because it generates directions within any given dimension. Neither direction, nor dimension, however, is an exclusively geometrical category. They are both applicable to various kinds of manifolds of non-geometrical as well as meta-

geometrical nature, such as color-schemes or space-time. The characteristic feature of a one-dimensional manifold, according to Riemann, is the property of duality, *i.e.* that from any point belonging to the manifold progression is possible in two directions, and in two only ("eine einfach ausgedehnte Mannigfaltigkeit, deren wesentliches Kennzeichen ist, dass in ihr von einem Punkte nur nach zwei Seiten, vorwärts oder rückwärts, ein stetiger Fortgang möglich ist").[4] This property originates in the situation of facing.

It is profoundly significant that philologically the word 'face' is closely related to the verbs to do and to make. The Latin *facies* is commonly regarded as a derivative of *facere: quando facies sit forma omnis et modus et factura quaedam corporis totius.* The historical dependence, however, is probably reverse. Face is the original, primitive concept expressing and defining a certain characteristic situation, which, along with right and left, and up and down, permanently accompanies us in our journey through the world. The world, *our* world as an entity, is specifically colored by the fact that we are beings that have faces. For face is the fundamental category that determines our position (κεῖσθαι) in the world (Heidegger's *In-der-Welt-Sein*).[5] Whatever we do we must face. The world originates in work. For what we call things are largely complexes of endeavor, situations that we face in practical contact—in other words facts, frames of a prospective work, *prolata*. Face is the most fundamental, aboriginal direction in space, probably the origin of our empirical space as visually extended field, container of things. 'In front' is the pivot of our geometrical orientation. And the primitive 'in front' must have been practical rather than mathematical or geometrical. It meant what was first or primarily to be done, a field of work. Portuguese *faceira* means cultivated acre, nearby a village. In Logudorian dialect *affakka* means near-by. Moreover, facing suggests a journey in *proficiscor*, which is related to *facies* through *facio;* it is a point of departure from which everything starts. If relation, therefore, is facing a situation, it must

[4] Riemann, *Ueber die Hypothesen, welche der Geometrie zu Grunde liegen*, p. 4, Weyl's edition, 1919.

[5] M. Heidegger, *Sein und Zeit*, JAHRBUCH FÜR PHILOSOPHIE UND PHÄNOMENOLOGISCHE FORSCHUNG, *passim*.

be regarded primarily as pro-lation, a logical movement away from. . . . In fact, the early Christian theologians, who under the term Trinity often discussed the logic of relations, coined the word *prolatio*, which corresponds to the initial stage in the process of relation by virtue of which one term (face, image, hypostasis) proceeds to generate its relative co-factor.[6]

Next to 'away from . . .' the current conception of face suggests revelation, in the sense that facing reveals facts *genuinely* relevant to the situation in question. This is not a vague analogy with more or less strong anthropomorphic implications. It is a descriptive property of every relation. By revelation we here do not mean 'consciousness of' or 'subjective discovery of' an object. In *a*R*b* *a* is not necessarily conscious of *b*. It may or may not be so, according to the nature of the relation. The master is conscious of his slaves. But the right is not conscious of the left, at least not in its own genuine function as a geometric direction. In *a*R*b* R does not mean that *a* discovers *b*. And yet it decidedly and genuinely means that *a* reveals *b*, in the sense that it denotes the bearing that the elements of *b* have upon the whole situation. If, in accordance with our previous suggestions, we imagine *a* as a sort of logical screen, or face, then what is performed upon that screen is, not *a*'s own content, but *b*'s relative properties.

Philology may be cited again to clear up the intricate connexion between facing and revelation. Face, through Latin *facere*, *facies*, points to the Greek φαίνειν, to show, or φαίνεσθαι, to appear, and φημί, which all have their source in Sanskrit *bha*, to shine, to flash. The latter is believed to be closely connected with *sphay*, to be distended (Old Persian *bann*, beam), which shows that all these words were originally expressions of orientation.

Reference. This extrinsic aspect of relation is retained in reference, which in popular usage still means a written statement of the qualifications of an employee given by the employer. This

[6] Tertullianus, *Apologeticus adversus gentes* (*Patrologiae Cursus Completus*, I p. 457), "Hunc ex Deo prolatum dicimus, et prolatione generatum." *Cf. Libri adversus Praxeam*, I. p. 186: "protulit enim Deus Sermonem, . . . sicut radix fruticem, et fons fluvium, et sol radium."

popular usage, however, is in English by no means the original. The word was used by Chaucer in the sense of sending back. Modern English seems to omit 'back', reserving all the implications of the return action for such words as response and relation. Reference retains only the esoteric signification of directing attention to something or somebody else. In 'referring a matter to . . .' we, at least in some respect, shift the responsibility for it from ourselves to somebody else. In a sense, we send it away in some specific direction, and deliver it into some one else's hands. Thus reference is an incomplete relation. It changes faces by bringing the matter to the cognizance of another person or term. But this latter remains extraneous, and may fail to send it back; for the reference may be misleading or irrelevant. The reflex motion is here subjectively expected, but not objectively necessary. Reference is relation in the state of unrest. It tosses the matter from one term, or face, to another—and *first* to one, *then* (possibly) to another. It represents relation in the state of unstable equilibrium, which means that it misrepresents it. In which direction is relation misrepresented by reference?

The logical material constituting both is practically the same. Both are derived from *re*, particle of iteration or intensification, and *fero*, *tuli*, *latus*. But the manner of synthesis in 'reference' is much simpler than that in 'relation'. There are two separate and temporally different operations in 'reference': a certain matter is *first* sent away, and *then* brought back again. This is altogether too simple to account for the mechanism of relation, where similar operations are performed simultaneously, and in a peculiarly penetrating manner which makes it difficult to set them apart. Moreover, the terms in reference differ from those in relation in that they are external to, and independent of each other. When I refer to a certain page in Darwin's *Origin of Species* I cannot possibly imply that that page means nothing apart from what I say about it, or that it was written with the view of supporting my remarks. But master actually means nothing without slave, nor slave without master. The latter two *aid* each other in a more intimate and more intricate fashion. The terms in reference also aid each other, but chiefly through the medium of an external factor—myself, consciousness, or a

book, a passage, etc. It is not the term itself that performs the operation of reference, but somebody, or something, else. In a word, reference is relation simplified. And unfortunately this simplified edition is often misrepresented as the original one.

Relevancy. Reference has more than the subjective significance of a source of knowledge, or means of obtaining information from something or somebody else. When I refer to a certain page in a certain book, I can do that only because the information is thus obtainable. That is, subjective information obtained from a reference must be based upon objective relevancy of the referendum. The reflex movement expected from a reference depends upon the nature and character of the thing to which I refer, and is granted to me only because the thing is objectively capable of producing the results expected. Reference is not merely sending away—this would be identical with dismissing the matter—but sending away in a specific direction. Specifying the direction of the attention is an essential element of the meaning of the word. And this can be done only in so far as that specific direction is relevant to the situation.

This supplies another salient point for describing the behavior of terms in relation. Each of the two terms, for its meaning and subsistence, refers to the other; and in order that such reference should have any effect at all, each must be so constituted as to be able to supply something to the other. In other words there exists mutual aid among the terms in relation.

Correspondence. It will be convenient at this point to recapitulate the results thus far reached. We have described relation as 'facing a situation'. It lies in the nature and meaning of the word 'face' that a source of operation is thereby defined in the direction 'away from. . .'. This specific directedness and esoteric nature is retained in English in the word 'reference'. The logical energy that runs through relation has no beginning—and here lies the greatest difficulty in describing it. But in reference there is a definite starting-point, an in itself well-defined initial situation, from which a matter is being sent away, and to which it is expected to return enriched by communication. The circulation of logical energy is here at certain points arrested, and we are allowed to examine it while it is, so to speak, at rest.

It is like taking a series of instantaneous photographic snaps of the continuous and uninterrupted race in which relation has its existence. But it is precisely for this reason—because it kills the Heraclitic inconsistency of relation—that reference misrepresents it. Yet we have seen that reference contains certain features in common with relation. The terms in reference, though independent, cannot be entirely irrelevant to each other. And here we saw the origin of the mutual aid that exists among the terms in relation. We are now confronted with the difficult problem of describing the manner in which the terms necessitate, or sponsor, each other's meaning.

When, in the process of an argument, you refer me to a certain page in a certain book, I expect that the information thereby obtained will elucidate something in the issue at hand. I expect it to fit in, to respond to, a definite need in demonstration, to fill in some hole in the argument. In other words there is something in our argument that corresponds to the reference. Of course, this something is not a mere absence of the information desired or expected. Argument is not a box where references could be geometrically deposited. There must be something in it with affirmative qualifications to accommodate the information expected. In this particular case this something is furnished by a definite question which is answered by the reference.

But the terms in relation do not ask questions, and do not wait for an answer. The specific necessity that binds relation does not coincide with that which unites question and answer together. Yet the analogy is not entirely meaningless. For each term in relation has a logically determinable output only because it fits into the field prepared for it by its relational opponent. Relation is a coöperation of two factors in fitting or organizing one situation (*unum regnum*). Language expresses this by the word correspondence, which may be properly translated as coöperation in fitting a given situation. The terms in correspondence appear as sponsoring a certain cause, or working together in the name of a common purpose (*συνδημιουργοί*).

Mathematically, correspondence is a method, or rule, by which, if one series is given, the other may be generated by reference to it. Two series s and s' are said to be in correspondence when

there is a one-one relation coupling every term of s with a term of s', and *vice versa*.[7] Functions with their dependent and independent variables are the simplest logical instances of series coördinated by correspondence. In the expression $y = f(x)$ both x and y are, not single quantities, but series of values in one-one correspondence to each other. If the form of function is known, then to every value of y corresponds a unique set of values of x. If we confine our observations to integers only, the function $y = x^2$ may be expressed by the one-one correspondence of the following two series:

$$\pm 1, \pm 2, \pm 3, \pm 4, \pm 5, \ldots .$$
$$1, \quad 4, \quad 9, \quad 16, \quad 25, \ldots .$$

According to the rule expressed by this quadratic function, to every value of y correspond two unique values of x. In a geometrical continuum where the values of x are not confined to integers, this function may be taken as describing the coördinated behavior of abscissæ and ordinates which results in a parabola.

Terms in relation also stand for series. They are subject to description and definition. And both descriptions and definitions run in series. The slave works . . . belongs . . . revolts . . . obeys . . . etc. The totality of these predicates would express fully what the slave is. But we do not know the totality of his predicates. We only know a small part of them. Hence our series is incomplete. We can represent it by

$$s = a, b, c, \ldots, x, y, z, \ldots .$$

But—and this is important—our information is not haphazard. We can indefinitely continue our research (historical, economical, ethical, statistical, theological, etc.) concerning slavery, and we have a good deal of genuine guidance from the information already at hand, that is, from $a, b, c, \ldots$, etc., and also from the laws and rules governing the whole series. At least some of the x, y, z, can be deduced from the nature of the series, *i.e.* they may be generated according to a prescribed rule. One way of obtaining information concerning the unknowns is by considering that they are functions of s', *i.e.* that they must correspond to the members of the associated series expressing the nature of the master.

[7] Russell, *Principles of Mathematics*, p. 261.

Moreover, it is possible to describe the method by which one series can be obtained from the other. Just as the mathematical formula $y = x^2$ gives me a rule for transforming the series of x's into that of y's, similarly relation furnishes a simple principle for constructing logical series. There is a dependence or necessitation of one series by the other. But this necessitation possesses no mystical powers. There is no mysterious force that compels a relative term to take a certain shape because its companion so wishes. There is no causal dependence between the two (*nihil, quod productione in esse venerit*). A term does not compel the other term to exist. What happens is something remarkably simple. To every element, property, or activity, x, of a relative term s, corresponds an element, property, or activity, $y = -x$, in the relative field of s. All the properties of the relative field of s have a negative sign with respect to s's own properties. There is just as much negation in the field as there is affirmation in the face, and *vice versa*. This does not mean that either of them is originally negative; but they fit each other within the relational situation only because, and only in so far as, they operate negatively with respect to each other. That the slave belongs (x) to his master *means* that the latter owns ($-x$) him. That he obeys his master *means* that the latter commands him to do something.

It may seem that mutually negative entities cannot be said to be in correspondence with each other. Correspondence presupposes harmony, and cannot be found where hostility and discord prevail. Yet nothing, according to Sainte-Beuve, resembles a hollow so much as a swelling. Nothing fits more precisely than the concave and convex side of the same surface. One cannot be drawn without the other. Convexity is a negative copy of concavity,[8] yet so that neither is capable of separate existence. When one of them is mathematically formulated as a distinct function, the other is implicitly formulated with it. They constitute separate functions only because in analytical geometry right and left and plus and minus are arbitrarily assigned to

[8] It is easy to see mathematically that a concave surface can be geometrically transformed into a convex one by changing the system of coördinates to the reverse position of the axes, *i.e.* by assigning negative values to xyz wherever they originally had positive ones.

opposite directions. In other words, their separation is relative, —relative to two frames of reference constituted by two opposite systems of Cartesian coördinates. But these frames of orientation are really irrelevant to the description of the intrinsic properties of the surface involved, which is one. The surface can be adequately described by the intrinsic equations of differential geometry without reference to any Cartesian frame whatsoever, *i.e.* by stating the distances between the various pairs of points in it.

We can now generalize this situation. Concave-convex surface is a good model of relation. But it is not the relation as such. In which way, or ways, does this model represent the behavior of terms in relation? First, we observe that the descriptive properties of a face in relation, which constitute a series, correspond to the descriptive properties of its relative field in precisely the same way in which the points of a concave surface correspond to those of the convex. They are in one-one correspondence because they are *the same points* taken relatively to two different frames of reference. In our model we see how and why they are the same, and not the same,—a situation that so profoundly puzzled Hegel and his followers. Just as points on a curved surface appear as concave or convex, each relatively to its respective system of coördinates, similarly the descriptive properties of the relation of slavery—or any other relation for that matter—appear as master with respect the slave's frame of reference, or as slave with respect to the master's. They fit each other very precisely because they are negative doubles of each other.

Secondly, we observe that facing its own relative field the term becomes logically absorbed by it. In the slave's world it is the master who is primarily in view. In a's field it is b which is manifested. From our model we see how it is done. By facing a surface from the concave side you must assume the position of a reference-frame reverse to that in which the surface behaves as concave. This is a somewhat awkward expression of our daily experience. In facing things we see only those surfaces which face us, or 'look at us' in opposite directions. It is more than our daily experience. We cannot get rid of it even in our

dreams. It is a feature characteristic of any experience. For experience is relation. Our conception of the world is profoundly modified by this specific relativity. Nature, world, God, as 'outside' immensities in which there seems to be no reasonable room for our humble consciousness, are descriptive results of this common experience of facing. Experience, *i.e.* 'we', is lost in what is experienced. This misfortune we share with every term in relation. Each term is a face, *i.e.* a screen upon which the logical drama of its relative companion is played. The more perfectly the drama is presented, the less visible is the screen. The term must recede, or, figuratively speaking, forget and lose itself, in order to find its relative companion (*dein Verlieren ist dein Fund*).

But as the drama of the term unfolds itself all its participants begin to realize that they are moved by a force which controls and binds every limb of their logical organism. Sooner or later they are bound to come to the conclusion that they are mere marionettes pulled by the strings of their all-powerful companion. They are manifestations of its logical energy. Thus they are obliged to return to the source of that from which they had never been separated (*rediturus eo, unde separatus non fuerat*).

The negative character of the field, however, with respect to the face is not completely revealed by reference to negation. It is true that the field of A is non-A. But it is not merely that. Non-A here is not a formal privation, but acquires an affirmative character from the universe of discourse. It is not an empty form for the other term to fit in, but a logically active force, or more precisely, another operation. Hence every relative term is an operation upon operation, and not an entity somehow connected with another entity. The model that is commonly used to describe relation—two points connected by a line, or two letters with a third between, such as aRb—is misleading and actually incorrect. For what we descriptively find in relation is two parallel, yet reverse, operations, not entities connected by means of a mysterious, indefinable link. We shall presently see that the link does not exist.

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(*To be concluded*)

DISCUSSION

"THE PARADOX OF THE TIME-RETARDING JOURNEY"

PROFESSOR Lovejoy's article in this REVIEW (this volume, pp. 48–68, 152–167) calls for extended discussion, more extended indeed than is possible within the limits of a single paper.[1] I therefore shall confine myself mainly to what he says about the retardation of clocks and of senescence in the Special Theory of Relativity. This theory has to do only with systems in relative motion with constant velocity. With such motion there is of course no return journey. But I must touch here and there upon the problem of a return journey, since Lovejoy mixes this problem up with that involved in unaccelerated motion, as will be seen from the first quotation below. Some scrambled eggs have to be unscrambled—if we are to get live eggs out of the scramble.

In speaking of the return journey he says:

> it is assumed (in the Special Theory) that the only motion in question *is* the relative motion between the two systems, and also that any effects . . . of the acceleration (if there are any such effects) will be due solely to the change in this relative motion, *viz.*, to the change of the direction of the motion of each system with respect to each other. Any *such* effect, then, resulting from the acceleration should be the same on both systems (p. 62).

It cannot be too strongly emphasized that the Special Theory has *logically nothing to say* on retardation involved in a journey *to and fro*. It makes no assumptions whatever as to the effects of acceleration. It deals only with journeys to an undiscovered country from whose bourne no traveller returns. Einstein did, indeed, in 1905 draw a conclusion from the Special Theory as to what would happen if a traveller did get back therefrom. But there was nothing in his equations at that time to warrant this conclusion, and this is now generally recognized by those who are familiar with them. But let us continue our quotation:

> There is, it is true, a tendency among physicists, even when expounding the Special Theory, to drag in a third (and essentially an absolute) reference-body,

[1] Since in that article Lovejoy makes no reference to another which he recently published in the JOURNAL OF PHILOSOPHY (Vol. XXVII, Nos. 23 and 24), I assume that in the former he is not building upon conclusions he thinks he has established in the latter. The two articles seem to be logically independent. All page-references in my paper are to the article in this REVIEW.

> as an explanation of the postulated absoluteness of acceleration. [This shows the danger a critic of the Special Theory incurs when he relies on non-mathematical expositions of that theory, instead of going back to its equations.] This conception, however, has a place—if anywhere—only in the General Theory; its use in that theory will be considered later. Until such a conception is explicitly introduced and justified, we are concerned only with the motion which is a private affair between Peter and Paul;

the latter having made a stellar journey and returned (with physiological complications, so Lovejoy thinks) to his twin brother. Until the General Theory is introduced, I must repeat, or until we explicitly make some further assumption, we are *not* concerned (except perhaps emotionally) with this private affair between principals dealing with each other under conditions for which the Special Theory makes no provision. But if we do interfere, Lovejoy is more correct than he realizes when he goes on to say:

> and from this point of view, *i.e.*, that of the Special Theory, we must still conclude (a) that no comparative retardation whatever can be deduced for the case of a journey in which there is a reversal of direction.

He is correct because no conclusion whatever, either about comparative retardation, or about comparative *non*-retardation, on reversal of direction, can be deduced from the Special Theory alone. But he commits a fallacy and arrives at a false conclusion when he goes on to say:

> but (b) that if there *were* any retardation—*i.e.*, if the acceleration in question were treated as theoretically negligible—the comparative retardation inferrible would necessarily be reciprocal (p. 62).

Here he reaches a result that is comparable with that of a critic who should argue that, *if* Lovejoy were, along with all his present views, also an epistemological monist, he would be a most self-contradictory philosopher. Obviously this conclusion would be false, but no more so than Lovejoy's, as will be shown before this discussion is concluded.

But the contention that I wish especially to discuss is put forth in the following passage, which I must quote quite at length. "The paradox of the twins—in its symmetrical form—arises even though no reversal of Paul's motion, and no acceleration whatever, is supposed to occur." We are to

> imagine Peter to be on a flat platform extending as far as we please in either direction, and Paul to be on a similar platform immediately adjacent to Peter's and in uniform unaccelerated motion relative to it and parallel with it. If, *while the two were at rest, synchronized clocks* and automatic cameras were placed at intervals along the inner edges of both platforms, the event of any

> reading of any one of Peter's clocks will be simultaneous with the reading of any clock of Paul's which may be passing, for both clocks will be in this case virtually in the same place.

Now, "in order to avoid any complication involved in getting the motion started", we are to make a further supposition:

> Peter and Paul, not now brothers, must be supposed to have been born simultaneously at points A and A′ when these points on the two platforms were passing each other, and each remains throughout at the place of his birth on his own platform. In both directions from A and A′, on both platforms, observation-posts are placed at wide intervals; at each of these assistant observers are stationed, duly provided with *clocks originally synchronized*. It is the law on each platform that no one can be appointed an assistant observer unless he was born *at the same time as Peter and Paul*. Assume that 70 years have elapsed on Peter's platform up to the moment when he passes observation-post P′ on Paul's platform. Given sufficient velocity, he, an old man of 70 gazing at his *coeval*, the assistant-observer at P′, will seem to that observer to be a young man of 21; and assuming, as is done in the customary story, that *a retardation observed from one system is a physical fact on the other*, Peter will *be* [Lovejoy's italics] twenty-one as well as seventy. At the same time his *coeval* at P′ will appear to Peter to be 21, and will therefore be of that age, as well as of the age of seventy. We thus eliminate any acceleration, and therewith all attempts to evade the symmetrical form of the paradox by invoking accelerations (pp. 63–64).

The reason why I have italicized certain words in this passage is that in one case they are ambiguous and in the others they signalize the points at which Lovejoy introduces into the problem features that do not appear in it as it is faced in relativity-physics. *They insinuate into the relativistic problem a Newtonian postulate.* Reasoning from this Newtonian postulate, innocently smuggled among the relativistic assumptions that are left intact, it is no wonder that Lovejoy gets a result that is neither Newtonian nor relativistic, but a jumble of contradictions.

The statement that "a retardation observed from one system is a physical fact on the other" is at best ambiguous. Any retardation of a clock on its platform is of course a physical fact, and this clock's retardation as measured on the other platform is a physical fact. But if the clock is a good Einsteinian one, its retardation is not a retardation with respect to the time-system of its own platform; its being a good clock is a guarantee against that. Its retardation is with respect to the time-system of the platform relatively to which it is in motion. The kind of retardation under consideration is analogous to largeness. A man of average size may be large. His largeness is a largeness where he happens to be; he could not well be

large where he was not, any more than he could be of average size where he was not. But just as his being of average size is a characteristic he has with respect to the standard size of his own people, so his being large is a characteristic he has with respect, let us say, to the standard size of a race of pigmies. Retardation, like largeness, is always a relative (or, if Lovejoy prefers, a respective) characteristic. Anything that changes too slowly changes too slowly (*where it is*) in comparison with some *other* change (*where that is*) which is used as the measure of the rate. But this retardation is not a physical fact *where that other change is occurring.*

The first italicized words, and the word "originally" next italicized, show that Lovejoy wishes to have had the clocks on the two platforms synchronized while they were relatively at rest. If this is done and the clocks are afterwards left untouched, acceleration is introduced into the transaction, for when the platforms are eventually set in motion there is of course acceleration. *The clocks in the Special Theory can be properly synchronized only when the relatively moving systems are moving with unaccelerated velocity.*

The word "coeval", appearing twice, and the phrase "born at the same time as Peter and Paul", taken in the context in which they appear, seem to indicate that simultaneity of birth is tested by clocks synchronized while the platforms were relatively at rest. But leaving this aside, a relativist would call attention to the fact that in relativity-physics any babies born (at different places along the line of relative motion) at the same time (by Paul's clocks) as Peter and Paul, are not "coeval" with any babies born (at different places along the line of relative motion) at the same time (by Peter's clocks) as Peter and Paul. Here then the problem is set by Lovejoy in terms of a *universal simultaneity*, which is directly at variance with the relativistic application of the conception of simultaneity to events at a distance from each other. This is as if a critic, after surreptitiously introducing a Euclidean postulate among those of Riemann, were to show that from all the postulates now on hand contradictory conclusions followed.

The fact that a philosopher with Lovejoy's reputation for carefulness can fall into such fundamental mistakes about a theory he is criticizing makes it desirable to go somewhat into detail in stating just what the Special Theory maintains with regard to the retardations of clocks and of other physical processes. In order to give an accurate picture of what we are to consider, it will be necessary to introduce measure-numbers into our discussion. In doing this, I shall give the results of calculations in the text, putting the calculations into footnotes.

In this way a reader who is interested only in the picture need not bother about the calculations upon which the picture is based; and the more exacting reader can check up the calculations. Any one who has had a few weeks of high-school algebra can easily follow them. One who has never used the Lorentz transformation can, by reading the footnotes, get some idea of the technique of its employment.

Let us take Lovejoy's general set-up, consisting of two straight platforms of indefinite length, moving relatively to each other and always keeping a constant clearance between them sufficient to prevent disaster; for they are to have the uniform speed of 177,425 miles per second.[2] Peter's platform is to move relatively to Paul's in what we shall take to be the positive direction—let us say eastward. Hence Peter's velocity v is positive, *i.e.*, $v = 177{,}425$. All the clocks on the two platforms are to be such that, *if* they were relatively at rest, they would run at exactly the same rate, and of course that rate would be such that light *in vacuo* would have the velocity $c = 186{,}000$ miles per second.

Distributed as they are in our set-up, the clocks on each platform are to be synchronized by light-signals in the well-known way, while the platforms have the constant relative speed v. Any reading of 'Paul's clocks' (*i.e.* clocks on Paul's platform) we shall designate by t. Any reading of 'Peter's clocks' (*i.e.* clocks on Peter's platform) we shall designate by t'. On either platform every point with which we shall deal is to have, not only a clock, but also a milestone, marking its distance, measured on that platform, from the 'origin' of that platform, *i.e.* from the point on that platform from which all distances on that platform are to be measured. The origin of Paul's platform we shall designate as A, that of Peter's platform as A'. The reading of any of Paul's milestones we shall designate as x, that of any of Peter's milestones as x'. When one of Peter's milestones is directly opposite one of Paul's, we shall for brevity say that the milestones 'coincide', since the small distance between them at that instant is at right angles to the relative motion of the platforms and is therefore not relevant to our present problem. Thus the two milestones are

[2] The reason why this speed is selected is that we wish the β of the Lorentz transformation to have the value $\beta = 10/3$, since Lovejoy uses the ages 70 and 21 in his story. In that transformation β is defined as $\beta = c/\sqrt{(c^2 - v^2)}$, where c is the velocity of light and v the relative speed of the moving systems. When $\beta = 10/3$, we write $c/\sqrt{(c^2 - v^2)} = 10/3$; and by solving for v we get $v = c\sqrt{91}/10$. Now $\sqrt{91}$, to three decimal places, is 9.539. Hence $v = 177{,}425$ miles per second, if we take the velocity of light as $c = 186{,}000$ miles per second. Our units from now on, till further notice, will be miles and seconds.

for that instant considered as "virtually in the same place"; and any events that occur, one at one milestone and the other at the coincident milestone, we shall consider as occurring "at the same place". The importance of emphasizing this is that, in relativity-physics, any two events that occur "at the same place", if simultaneous in any system, are simultaneous in all systems moving perpendicularly to the direction between the two points at which they occur. Therefore events that occur simultaneously at coincident points on our two platforms are simultaneous on both platforms. The reader knows that in relativity there is an important difference between 'simultaneity at the same place' and 'simultaneity at a distance'. This difference, however, is not in the connotation of 'simultaneity', but in its denotation; just as 'father' has the same connotation for all English-speaking peoples, but different persons apply the word to different individuals, you to one man and I to another.

We shall lift the embargo Lovejoy places on observation by any one who is not "coeval" with both Peter and Paul. This is necessary because we shall need legitimate observers, and cannot get them under Lovejoy's law; that law, as we have seen and shall see more clearly as we go on, is unconstitutional within the domain of relativity. Besides, we shall need witnesses to the births of Peter, Paul, and sundry other babies: we do not wish to get so far away from plausibility as to allow babies to date their own births without assistance. Therefore we station two ideally competent observers, one at each of any momentarily coincident points upon which our attention may fall. This competence consists in the possession of vision so keen and alert that each observer can see at any time at least six things: (1) the coincidence of his milestone with a milestone on the other platform, (2) the reading of the latter milestone (he is supposed to have learned by heart the constant reading of his own), (3) the reading of the clock beside the milestone on the other platform, (4) the reading of his own clock, (5) any other fact of interest, such as the birth of a baby or the exact physiological age of any one, at any momentarily coincident station of the other platform, and (6) any such fact at his own station. Having seen, he is to make a true and complete record. It is to be especially emphasized that the reading of *each* of any two coincident clocks is to be witnessed and recorded by *two* observers, one on *each* platform.

A and A' are to coincide on January 1, 1900, exactly at noon, which is to be the zero hour for both systems; thus Paul's clock at A has then the reading $t = 0$, and Peter's clock at A' the reading $t' = 0$. At

exactly this time Paul is to be born at A and Peter at A'. Here we have simultaneity at the same place (and therefore simultaneity shared by the two platforms) of five events, *viz.* the coincidence of A and A', the two clock-readings, and the two births.

Needing more babies we call for the birth of a cousin of Paul's at P on Paul's platform at time $t = 0$ by Paul's clock there. P is $7\sqrt{91}$ (= 66.773) light-seconds—a light-second being the distance light travels in a second—or $7c\sqrt{91}$ miles from A, as measured on Paul's platform, and its direction from A is that in which Peter's platform is moving relatively to Paul's. Peter will therefore in due course pass this baby. To even matters up, a cousin of Peter's is to be born at P' on Peter's platform, P' being the point coincident with P when Paul's cousin is born at P; and the birth of Peter's cousin is to occur simultaneously with the coincidence of P' with P, and consequently simultaneously with the birth of Paul's cousin at P. Here again we have simultaneity of five events at the same place, *viz.* the coincidence of P with P', two births, and two clock-readings. One of these readings, that of *Paul's* clock, is $t = 0$. But the reading of *Peter's* clock is *not* zero; it is[1] $t' = -212\frac{1}{13}$. Thus this clock of Peter's at P' is at this time slower by $212\frac{1}{13}$ seconds than Paul's coincident clock at P. This means that, since on Peter's platform the clocks at A' and P' are synchronous, the five events at P and P' that we have just been considering occur earlier by $212\frac{1}{13}$ seconds, by Peter's time-system, than the other five events we considered previously, *viz.* those at A and A' when these points were coincident; since the events at coincident P and P' occur at time $t' = -212\frac{1}{13}$ by Peter's clocks, whereas the events at coincident A and A' occur at time $t' = 0$ by Peter's clocks. (The reader will bear in mind that although *we* have had to calculate in order to get this result, the two

[1] This result is obtained in the following way. We have four known values: the reading of the milestone at P is $x = 7c\sqrt{91}$; the reading of Paul's clock at P is $t = 0$; and the constant values in our problem are $\beta = 10/3$ and $v = c\sqrt{91}/10$. We wish to ascertain the value of t' (the clock-reading at P') simultaneous with t and "at the same place" with x. We look among the Lorentz transformation-equations for one that has as its terms our five values, x, t, β, v, t'; and by substituting into it the four given values we obtain the fifth desired. The Lorentz equation that has these five terms is

$$t' = \beta(t - vx/c^2).$$

By making the indicated subetitutions we get

$$t' = 10/3 \times (0 - [c\sqrt{91}/10 \times 7c\sqrt{91}]/c^2) = -(7 \times 91)/3 = -212\tfrac{1}{3}.$$

The minus sign tells us that the time t', when P and P' are coincident, is before twelve o'clock.

observers at P and P' *do not have to calculate.* Being competent observers, both of them *see* the readings of both clocks.)

There is nothing in this that the logical reader need boggle at. He is already familiar with the fact that two witnesses may agree that two events take place *at the same time*, and yet may disagree as to *what* that time is, and thus may not give *the same time* to the double occurrence. In other words, the expression 'the same time' is ambiguous. Your clock and mine at the same time may not give the same time. To say 'at the same time' may be to assert (1) undated simultaneity, *i.e.*, simultaneity without reference to any time-system or 'calendar'. (In relativity, this is possible only of events at the same place.) On the other hand, it may be to assert (2) an agreement (congruence) between two clocks or calendars as to the dates of events at the same place, or (3) an equal dating of events at different places by synchronous clocks, *i.e.* by the same calendar. In the case before us, to say that the events at coincident A and A', or (*not* and) those at coincident P and P', occur at the same time on *either* platform is to make assertion (1). To deny that the events at coincident P and P' occur at the same time on *both* platforms is to deny assertion (2). To deny that the events at coincident A and A', *and* those at coincident P and P', occur at the same time on Peter's platform is to deny assertion (3).

Lovejoy's initial mistake, *fons et origo malorum*, in his misconception of the retardation of clocks in the Special Theory, is his assumption, entirely at variance with the doctrine he is criticizing, that *because by Paul's clocks* all the four births we have been considering are simultaneous, *therefore* they are simultaneous *without qualification*, and *therefore* simultaneous *on Peter's platform*. (If I remember aright, this would be called in the Aristotelian logic a fallacy of accident. Or is it a *petitio?*) By *Paul's* calendar all four babies are "coeval" in the sense that they are 'born at the same time'. In this sense, the babies born at P and P' are *not* "coeval" *by Peter's calendar* with those born at A and A'. But to be "coeval" may mean to be 'continuously of the same age'; in this sense, only Paul and Paul's cousin at P are relativistically "coeval", and they are "coeval" only by Paul's clocks. In Newtonian time these two meanings of "coeval" are exactly convertible, but they are not exactly convertible in relativity. This difference will be made clear later on in this paper.

Meanwhile let us follow Peter as he speeds along Paul's platform until he comes directly opposite Paul's cousin at P. By *Paul's* clock there, this event occurs at time $t = 70$, *i.e.* at 70 seconds past twelve

o'clock.[4] But this is *not* the time as given by *Peter's* clock, which on his arrival at P has [5] the reading $t' = 21$.

Now let us turn our attention to point M' on Peter's platform *west* of A' and distant from A' by $7c\sqrt{91}$, as measured on that platform. Let M be the point on Paul's platform coincident with M' at time $t' = 0$ by *Peter's* clock at M', *i.e.* at the same time by *Peter's* clocks as the coincidence of A with A' and the births of Peter and Paul. This coincidence does *not* occur at time $t = 0$ by *Paul's* clock at M; it occurs [6] at time $t = -212\frac{1}{13}$. Thus, whereas by *Peter's* clocks the coincidence of M with M' is simultaneous with the coincidence of A with A', and therefore simultaneous with the births of Peter and Paul, by *Paul's* clocks the former coincidence was earlier by $212\frac{1}{13}$ seconds than the latter coincidence and the births at A and A'. Please note again that *we* have had to calculate to find the reading of Paul's clock at M when it was coincident with M', but that the two *observers* at these points do not have to calculate; they *see* the reading.

Note also the chiastic symmetry between the readings, on the one hand, of Paul's clock at P and Peter's clock at P' when these points are coincident, and the readings, on the other hand, of Peter's clock at M' and of Paul's clock at M when these latter points are coincident. In the former case, where P and P' are in the positive direction from

[4] This result is obtained thus. Peter, who was born opposite A at time $t = 0$ by Paul's clock there, and who travels with velocity $v = c\sqrt{91}/10$, measured on Paul's platform, covers the distance $7c\sqrt{91}$, measured on Paul's platform, by time $t = 70$ by Paul's clock at P, since the time taken is equal to the distance covered divided by the velocity.

[5] This result is obtained thus. We have the four known values: $x = 7c\sqrt{91}$, $t = 70$, $\beta = 10/3$, and $v = c\sqrt{91}/10$; and we wish to obtain the value of t'. The Lorentz transformation-equation that contains these five terms, *viz.* x, t, β, v, and t', is the one we used in footnote 3, *viz.* $t' = \beta(t - vx/c^2)$. By substituting into this equation from the equations giving us the known values, we get the desired value $t' = 21$. What *we* here get by calculation, the two *observers* at A' and P get by looking and *seeing*.

[6] This result is obtained from a Lorentz transformation-equation, but not from the one we used in footnotes 3 and 5. That equation contained the five terms, t', t, x, β, and v. *Now* we have the following values as given: $x' = -7c\sqrt{91}$ (the minus sign because M' lies in the negative direction from A'), $t' = 0$, $\beta = 10/3$, and $v = c\sqrt{91}/10$; and we wish to obtain the value of t. Thus we have a term x' not found in that Lorentz equation, and that equation has a term x which we do not have as given in our present problem. But there is a Lorentz transformation-equation that does have our five terms, t', t, x', β and v. That equation is

$$t = \beta(t' + vx'/c^2).$$

We substitute into this transformation-equation the given values of t', x', β and v, and we get

$$t = 10/3 \times (0 - [c\sqrt{91}/10 \times 7c\sqrt{91}]/c^2) = -212\tfrac{1}{13}.$$

A and A', Paul's clock at P has the reading $t = 0$, and Peter's clock at P' has the reading $t' = -212\frac{1}{3}$. In the latter case, where M' and M lie in the *negative* direction from A' and A, and M' is as far from A' as P is from A, it is *Peter's* clock (not Paul's) that has the reading $t' = 0$, and it is *Paul's* clock (not Peter's) that has the reading $t = -212\frac{1}{3}$. The 'reciprocity' of clock-readings on the two platforms is *not* mutual reversibility of readings of clocks 'at the same place'; it is symmetrywith respect to similar *kinematic* conditions. The point M, going westward, is at a distance from A', measured on Peter's platform, equal to the distance, measured on Paul's platform, at which the point P', going eastward, is from A. Hence Paul's clock at M and Peter's clock at P' (M and P' *not* coincident) have *equal readings under similar kinematic conditions*, just as Paul's clock at P and Peter's clock at M' have equal readings under similar kinematic conditions. But this equality of readings is not simultaneity of readings, since the clocks with these equal readings are not on the same platform, and therefore are not synchronous.

Now, just as we followed Peter till he was passing Paul's cousin at P, let us follow Paul till he passes Peter's cousin at M'. Having passed A' at time $t' = 0$ by Peter's clock there, and having travelled with speed $c\sqrt{91}/10$ over a distance $7c\sqrt{91}$, as measured on Peter's platform, he arrives at M' at time $t' = 70$, by Peter's clock at M'. But *Paul's* clock at A, then coincident with M', does *not* have this reading; it has[7] the reading $t = 21$.

Here we have another example of the chiastic 'reciprocity' of clock-readings on the two platforms. Since Peter and Paul both started from kinematic scratch, *viz.* from coincident A ($x = 0$) and A' ($x' = 0$) respectively, at time $t = t' = 0$, the ratio between the readings of Peter's clock at A' and Paul's coincident clock at P, after Peter has traversed a scalar distance *eastward*, is equal to the ratio between the readings of Paul's (not Peter's) clock at A and Peter's (not Paul's) clock at M', after Paul has traversed an equal scalar distance *westward*. The symmetry does not consist in the mutual inversion of *coincident* clock-readings, as Lovejoy supposes when he makes Peter attribute to Paul's "coeval", whom he is passing, the age that the latter attributes to Peter. In relativity there is no such mutual inversion of unequal coincident clock-readings. *The relativistic reciprocity is symmetry with*

[7] Here we have the given values $t' = 70$, $x' = -7c\sqrt{91}$, $\beta = 10/3$, and $v = c\sqrt{91}/10$, and we wish to determine the value of t. The Lorentz transformation-equation that has these five terms is the one we used in footnote 6, *viz.* $t = \beta(t' + vx'/c^2)$. By substituting our known values into this equation we get $t = 21$.

respect to kinematic scratch. Here then we have another fundamental misunderstanding under which Lovejoy labors in seeking to criticize relativity.

So far we have been dealing chiefly with clock-readings 'simultaneous at the same place'. If relativity is true, observers, such as we have assumed, *consentiently* see, record, and report, all the facts we have recorded in the text. The computations we have made in the footnotes are *ours*, not theirs. We have had to make them because we were not bodily present to witness the occurrences. It is impossible to over-emphasize the fact that there is no disagreement as to what is directly observed by competent observers at any two coincident points. If there were any, observations under similar conditions would have to be repeated till agreement should be reached. If such agreement were unobtainable, we should have on our hands "a condition and not a theory". But there is no such disagreement; we have in each case, at the mouth of two witnesses, reliable data consisting of statements such as that the two coincident clocks at such and such points had severally such and such readings, and then such and such events occurred there. Where then does the 'disagreement' come in?

We are all familiar with the difference between the reading of a clock and the 'correct time' when the clock has this reading. In general practice we get 'correct time' second-hand from Washington by consulting local Western-Union clocks, intermittently synchronized by electro-magnetic impulses. But *if* every *identical* electro-magnetic impulse is to have constant velocity on each, and equal velocity on both, of our relatively moving platforms, the clocks synchronized on Peter's platform cannot have the same synchronism as those synchronized on Paul's.

Synchronism is a relation between clocks, and it consists in the fact that they (*a*) run at the same rate, and (*b*) are so set that any reading of any one of them is simultaneous with the equal reading of any other of them. If (*b*) is true (*a*) is also true, and therefore our definition is redundant. Still, it is important to distinguish (*a*) and (*b*), for the reason that (*a*) may be true and yet (*b*) may be false. But what for our present purpose is more important is that the asynchronism of Peter's clocks as tested by Paul's, and of Paul's as tested by Peter's, cannot be understood without this distinction. According to the current *Newtonian* conception, we may have two groups, each consisting of clocks running at the same rate and set together, the rates, however, of the two groups not being the same. In such a case, says the Newtonian, *any observer will see that the equal readings of the*

clocks of either group are simultaneous, but that readings of the clocks of one group are not, in general, simultaneous with equal readings of the clocks of the *other*. The clocks of one group will lose time as compared with those of the other; and *all* observers will agree *which* group is the loser. Any one who thinks only in terms of *this* conception will find the relative asynchronism of Peter's and Paul's relativistic clocks contradictory—but the contradiction will be with the terms in which he thinks, not an internal contradiction in relativity.

In order to understand relativistic time, we must not *start* with the idea that the clocks of either platform run slowly with respect to those of the other; we must start with the fact that *at no time, registered by the clocks of either platform, does any one of the clocks of the other have a reading equal to the reading of any other clock of that other platform* (unless the two latter clocks lie in a plane perpendicular to the relative motion of the platforms). In other words, the italicized statement of the preceding paragraph, which is true of Newtonian time, is not, in general, true of Einsteinian times. This is the basic difference between relativity and Newtonianism. The fact that the clocks of either platform run slowly, as measured by the synchronism of the other, is *a logical consequence* of the italicized statement of this paragraph. The relative retardation of clocks is a corollary of the intersystemic asynchronism of intra-systemically synchronous clocks, *i.e.*, of the fact that *simultaneity* is not in general shared by the two platforms. The popular expositions of the Special Theory, being popular, fail to bring out this logical relationship between 'retardation' and the fact that two relatively moving systems have disparate simultaneities. This logical relationship can be made clear only by following the *reasoning* of relativists as they proceed from the Lorentz transformation which they have derived, to the 'paradoxical' conclusions which they deduce. Let us see how this reasoning runs. In this paper it is obviously impossible to consider the *deduction* of the Lorentz transformation from the relativistic postulates. Those postulates, *if* accepted, compel the acceptance of the transformation.

To distinguish between the data involved in the acceptance of the Lorentz transformation, and the logical conclusions that follow, we shall now impose a hard law upon our 'observers'. *They* shall not *think* at all, in the sense of comparing any observation they may make at any time with those they may make at any other time, or with those which other observers may make 'at other places'. They are to do nothing but attend strictly to the six things their 'competence' enables them to do; they are merely to observe and record and report—

like private soliders, theirs is not to reason why. All the records thus made on Paul's platform are to be sent to the Office of the Register of Physical Deeds at A, and all the records made on Peter's platform are to be sent to a similar office at A'. At each office is to be an intelligent accountant, whose task it is to scan all reports and to make what he can out of them. He is an ideal statistician with no axe to grind; he is impartial between the clocks of the two systems, knowing that on each platform the clocks have been properly synchronized. Of course he must begin somewhere, and we let each accountant begin with the known fact that the clocks *on his own platform* are synchronous. We are now to look over the shoulder of the accountant on Paul's platform as he works. He writes the following memoranda.

"(1) *Paul's clocks are synchronous.* At time $t = 0$ *by Paul's clock* at A, A' was at A, and at that time *Peter's* clock at A' had the reading $t' = 0$. At time $t = 70$ *by Paul's clock* at P, A', having meanwhile travelled eastward, was at P, and at that time that identical clock of *Peter's* at A' had the reading $t' = 21$. Thus during a time-interval of 70 seconds (*i.e.*, the interval between $t = 0$ and $t = 70$), *as measured by Paul's synchronous clocks at* A and P, that identical clock of *Peter's* at A' advanced its reading by only 21 seconds. Therefore that clock of Peter's lost 49 seconds during a time-interval of 70 seconds, as measured by Paul's synchronous clocks at A and P; *i.e.* it lost time at the rate of 7 seconds in every 10."

Now the same accountant, knowing that *Peter's* clocks also had been properly synchronized, goes on to write as follows.

"(2) *Peter's clocks are synchronous.* At time $t' = -212\frac{1}{3}$ *by Peter's clock* at P', P was at P', and at that time *Paul's* clock at P had the reading $t = 0$. At time $t' = 21$ by Peter's clock at A', P, having meanwhile travelled westward, was at A', and that identical clock of Paul's at P had the reading $t = 70$. Thus during a time-interval of $233\frac{1}{3}$ seconds (*i.e.*, the interval between $t' = -212\frac{1}{3}$ and $t' = 21$), *as measured by Peter's synchronous clocks at* P' and A', that identical clock of *Paul's* at P advanced its reading by only 70 seconds. Therefore that clock of Paul's lost $163\frac{1}{3}$ seconds during a time-interval of $233\frac{1}{3}$ seconds, as measured by Peter's synchronous clocks at P' and A'; *i.e.* it lost time at the rate of 7 seconds in every 10."

Resorting to algebraic instead of arithmetical numbers,[8] and being

[8] Let us call Paul's platform S, and Peter's S'. At *any* point P ($x = n$) on S at *any* time $t = a$, the S' clock at P', then coincident with P, has the reading $t' = \beta(t - vx/c^2) = \beta(a - vn/c^2)$.

P', moving with constant velocity v in the positive x-direction of S, arrives at

an impartial accountant, who desires to avoid the appearance of making statistics lie by failing to tell the whole truth, he writes:

"*Measured by the synchronism of Paul's clocks,*[9] any one of *Peter's* clocks loses time, in going from any point to any other point on Paul's platform, at the rate of 7 seconds in every 10; *i.e.* it runs only 3/10 as fast as Paul's clocks". Then he adds as a footnote: "*Measured by the synchronism of Peter's clocks,* any one of *Paul's* clocks loses time, in going from any point to any other point of Peter's platform, at the rate of 7 seconds in every 10, *i.e.* it runs only 3/10 as fast as Peter's clocks."

If we now look over the shoulder of Peter's accountant, we shall find that the only difference between what he writes, and what Paul's wrote, is that the memorandum which Paul's accountant numbered (2) Peter's accountant numbers (1), and *vice versa;* and that what Paul's accountant put into a footnote Peter's accountant puts into the text, and *vice versa.* Such unanimity among accountants is surprising —at any rate it is refreshing—but what are we to expect from impartial and competent accountants who have exactly the same data to interpret?

Let us review carefully what each accountant has done. He compares (*a*) the reading of a clock on one platform with the reading of a coincident clock on the other platform, and (*b*) a later reading of the former clock with the reading of the then coincident clock on the other platform; and he treats the clocks on that other platform as synchronous, since they have been synchronized on their platform. Each of these comparisons gives the same result for both accountants. The only difference that can arise is a difference of *preference;* each

any point $Q(x = n + m)$ at time $t = a + m/v$. At that time the clock at P' has the reading $t' = \beta(t - vx/c^2) = \beta(a + m/v - v[n + m]/c^2)$. Thus during the time-interval which has the measure m/v by the S clocks at P and Q, synchronous on S, the clock at P' on S' advances its reading by $\beta(m/v - vm/c^2) = m/\beta v$. Thus whatever clock on S' is coincident with *any* clock on S at *any* time, will, after traversing *any* distance, have lost time, as measured by synchronous clocks in S, at the rate of $(\beta - 1)$ seconds in every second.

A symmetrical result is obtained for any clock in S, as measured by synchronous clocks in S', by using the transformation-equation $t = \beta(t' + vx'/c^2)$.

[9] It is to be observed that our accountant uses the word 'measured' instead of the word 'judged', frequently employed by other accountants. In this connexion they mean the same thing; but the latter is often misinterpreted as if the 'judgment' were not necessary in view of the numerical data furnished and of the fact that the clocks in each system have been physically synchronized. There is nothing 'subjective' in our accountant's statement, any more than if he were to say, "Measured by this meter-stick, this bar of iron is 2 meters long".

naturally prefers to use the synchronism of the clocks on his own platform—it is more convenient, and in fact the convenience amounts to a physical necessity for *observers*, since an observing physicist has at his disposal only his *own* instruments, including chronometers. Our set-up with 'competent' observers is an ideal one. A physicist would be decidedly embarrassed if, with chronometers flying by him at every conceivable speed short of the velocity of light, and in every direction, *he had to read every one*. He uses his own synchronism for the same reason that the terrestrial astronomer uses as *the* astronomical year the time-interval that is required for the *earth* to complete a revolution around the sun, although he is aware that *each planet has its own year*. Which is *the* true, *the* absolute, *the* cosmic year? The answer to *this* question is in principle the relativistic answer to the question: Which is *the* correct time-system? It happens that the transformation from the terrestrial year into the Martian year is not the same as that from Paul's synchronism into Peter's, but the latter is not necessarily 'subjective' for that reason.

If we have followed the reasoning of the accountants, we have seen that the reciprocal retardation of the clocks on the two platforms is not reciprocal inversion of *coincident* clock-readings. It is *because* there is *no such* reciprocity, *e.g.*, it is *because* the clocks at coincident P and P', and at coincident A' and P, have unequal and non-interchangeable readings when these points are respectively coincident, that the relativist concludes that the clocks of either system run slowly as measured by the synchronism of the other. If the readings of coincident clocks *were* interchangeable, as Lovejoy supposes, there would be no reciprocal retardation—there would be temporal chaos. Just try it out.

Now let us suppose that Peter's heart and the hearts of all his cousins beat once every second *by his clocks*, and that Paul's heart and the hearts of all his cousins beat once every second *by his clocks*. Let us further suppose that all the other physiological processes of each of these babies run at a normal rate as measured by his heart-beats. In accordance with this assumption, Peter is 21 seconds old *physiologically* when he arrives at P, since his clocks have ticked off 21 seconds since his birth. On the other hand Paul's cousin at P is 70 seconds old *physiologically* when Peter arrives at P, since Paul's clocks have ticked off 70 seconds since this cousin's birth. The two competent observers at A' and P agree in recording these respective physiological ages. Neither observer attributes to Paul's cousin the physiological age that the other attributes to Peter, nor *vice versa*. Our observers have

to do only with clock-readings and with events and facts simultaneous with these readings at the same place with these readings. The automatic relative motion of the platforms and the automatic movements of the clocks and of physiological processes furnish them with events and facts to be observed.

But the *accountants*, when they receive and examine the reports sent them, *compute the time-intervals involved*, and in doing this they discover that they must *distinguish between physiological and calendar ages*. Before they became relativists they had been familiar with this distinction. For instance, a child born in Moscow on January 1, 1800, O.S., was one year old, by the Russian calendar, on January 1, 1801, O.S. But by the calendar used elsewhere in Europe he was one year and one day old. The fact that the child had two calendar ages did not give him two physiological ages. Where two different calendars are employed, the same physiological age is compatible with two calendar ages. In relativity each of two relatively moving systems has its own distinctive calendar. By the supposition made in the preceding paragraph, the calendar age of any person, by the calendar of his *own* system, is equal to his physiological age. But his calendar age by the calendar of another system, which we shall for short call his 'heterochronic age', is not equal to his physiological age. We now let our accountants work out the problem.

"*Paul's clocks are synchronous.* Peter, having been born at time $t = 0$ by Paul's clocks, arrived (21 seconds old physiologically) at P at time $t = 70$ by Paul's clocks. Hence on Peter's arrival at P his heterochronic age by Paul's calendar (*i.e.*, the *measure* of the interval between Peter's birth and his arrival at P, as given by Paul's clocks) was 70 seconds, and this heterochronic age was $3\frac{1}{3}$ times his physiological age.

"*Peter's clocks are synchronous.* Paul's cousin at P, having been born at time $t' = -212\frac{1}{3}$ by Peter's clocks, arrived (70 seconds old physiologically) at A' at time $t' = 21$ by Peter's clocks. Hence on Paul's cousin's arrival at A' his heterochronic age by Peter's calendar (*i.e.*, the *measure* of the interval between Paul's cousin's birth and his arrival at A', as given by Peter's clocks) was $233\frac{1}{3}$ seconds, and this heterochronic age was $3\frac{1}{3}$ times his physiological age."

Note that neither the heterochronic nor the physiological ages of Peter and of Paul's cousin are respectively interchangeable. It is true that Peter's heterochronic age is equal to Paul's cousin's physiological age; but the reverse is not true. The 'reciprocity' involved here is in the *ratio* of heterochronic to physiological age. Each has a

heterochronic age 10/3 his physiological age. We may not like the calendars the relativist employs on his platforms, and therefore may not choose to run with him on them. But this does not justify us in misrepresenting the facts on his platform and then accusing him of contradiction—unless we choose to adopt the kind of logic that Lovejoy (or for that matter any of us at times, unless we are very careful) employs in dealing with those he criticizes.

Lovejoy thinks (pp. 155–156) that since "number (of discrete individuals) is an absolute quantity", the Special Theory is committed to an absurdity in treating durational lengths as respective. But the absurdity is in his imagination, not in relativity. All the *numerical* data involved, in the case of Peter and Paul, are agreed upon by both our accountants; just as you and I, travelling together, may agree that we passed 10 milestones while your watch was ticking off 15 minutes and mine 14. We agree on the count of everything we count, when we count the *same* things: milestones, your watch-ticks and my watch-ticks. We might under these circumstances dispute as to *how long* it took us to pass those milestones, unless we agreed that it took 15 minutes by your watch and 14 by mine. So far as the analogy holds, this is just what happens in relativity. The physiological ages of Peter and Paul, counted by heart-beats, are analogous to the milestones, and their heterochronic ages to your 15 minutes and my 14. All observers agree on the count of everything they count. It is agreed by all relativists that Peter's clock at A' ticked, and Peter's heart beat, 21 times from his birth till his arrival at P; and that the heart of Paul's cousin beat, and Paul's clock at P ticked, 70 times from *this* cousin's birth till Peter's arrival at P. The "discrete individuals" here are these clock-ticks and these heart-beats. Their number is "absolute" in the sense that *all* agree on the count. But when the question arises *how long* it took for these two sets of heart-beats and clock-ticks to run off, there is a double answer, depending upon the synchronism used. By Paul's synchronism, Peter and Paul's cousin were born at the same time; therefore, since Peter's heart, 70 seconds later by Paul's clock, had beat only 21 times, and that of Paul's cousin had beat 70 times, Peter was growing old physiologically only 3/10 as fast as Paul's cousin. By Peter's synchronism, Paul's cousin was born $212\frac{1}{3}$ seconds before Peter; therefore, since Paul's cousin's heart, $233\frac{1}{3}$ seconds later by Peter's clock, had beat only 70 times, and that of Peter $233\frac{1}{3}$ times, Paul's cousin was growing old only 3/10 as fast as Peter. There is no difference as to any count; there is difference only as to the *dates* at which the counting begins and ends; and on the

two platforms the dates are different because different calendars are used. Again, the idea that Paul should have eaten only 365 and also 25,550 breakfasts during a certain trip is of course absurd, but it is Lovejoy's idea (p. 155) attributed to the relativist. There is surely no absurdity in the idea that the number of hours taken to eat 365 breakfasts varies with the clocks used to measure the time-factor of the breakfast-eating process. The number of breakfasts any one on a relativist platform eats in making a trip is "absolute". The *time* it takes to make the trip, *when measured*, gives different measure-numbers according to the different clocks used in measuring. Lovejoy himself admits this when he says that "even this [lack of "accord" in "time-measurements"] would not amount to a contradiction" (p. 51). The correctness of his article lies mainly in his verbal insistence on thinking straight.

We are now ready to answer the question, What would happen if Peter were to *reverse his direction* and return to Paul, and "if the acceleration in the reversal were treated as theoretically negligible"? We shall treat "theoretically negligible" as synonymous with 'having no physical effects'. Let us add another platform to our set-up and call it 'John's platform'. It is to be parallel to the other two and in unaccelerated motion relatively to them. It moves relatively to Paul's platform in the direction opposite to that in which Peter's moves; and its speed relative to Paul's is 177,425 miles per second. It is equipped as the others, *i.e.* with clocks properly synchronized, with milestones, and with observers. We designate as A'' the point on it that is coincident with A and A' when these points are coincident with each other; at that time John's clock at A'' is to have the reading $t'' = 0$. We designate as K'' the point on John's platform coincident with P and A', when these points are coincident with each other, *i.e.* at time $t = 70$ and $t' = 21$. Thus on Peter's arrival at P, K'' is passing P going the other way.

This set-up is in accord with the Special Theory of Relativity. We now introduce a new assumption, not contemplated in that theory: we imagine both Peter and his clock at A' to be instantaneously transferred to K'' when directly opposite K''. This transfer thus takes place when Peter is 21 seconds old physiologically, and when his clock has the reading $t' = 21$. The transfer is to have no disturbing effects on Peter's physiological processes or upon Peter's clock other than that after it both Peter and his clock are to carry on just at the same rate as if they had been indigenous to John's platform. (This is of course a most violent supposition, as the transfer is a most

violent transfer; but we are not responsible for either. We are following Lovejoy's supposition, and merely wish to see whether his inference from it is correct.) Peter's heart continues to beat with his clock-ticks, and his clock now runs at the same rate as the clock originally at K''; the difference between its reading and that of the original clock at K'' is to remain constant. Now that original clock at K'' has the reading $t'' = 445\frac{2}{3}$ when the transfer is made, and Peter's transferred clock has the reading $t' = 21$. Hence after the transfer Peter's clock is to be constantly slower than John's at K'' by $424\frac{2}{3}$ seconds. Peter, now retracing his movement with the same speed back as he had on his out-bound journey, reaches A at time $t = 140$ by Paul's clock at A, at which time John's clock at K'' has the reading $t'' = 466\frac{2}{3}$. Hence Peter's transferred clock has then the reading 42, and Peter's physiological age, which has been advancing in the rhythm of his clock, is 42 seconds.[10] There is no 'reciprocal' retardation of clocks after the return journey has been completed. *It is the clock that reversed its direction that is slow.* Lovejoy desires that, since relative motion is relative and reciprocal, reversal of relative motion shall be reciprocal in its effects upon clock-readings and physiological processes. But we are dealing with *Einstein's relativity;* and when dealing with Einstein's relativity, we must use his relativity-*equations*. The physical theory of relativity is not just the classical theory of the relativity of motion dressed up in mathematical clothes. The only *logical* consistency that any theory is required to have is consistency *with itself*, not consistency with some one's preconceived notion, or even with some one else's internally consistent notions.

Now let us see what the comparative ages of Peter and Paul would be when they met, if *each* were to be transferred instantaneously to the other's platform, on the assumption that the transfers are to have no disturbing effects, and that they are made under similar kinematic conditions. Peter is to be transferred after he has travelled a given distance along Paul's platform, and Paul after he has travelled an

[10] This result is obtained by using for John's clock at K'' the Lorentz transformation-equation $t'' = \beta(t + vx/c^2)$. Into this we first substitute $x = 7c\sqrt{91}$, and $t = 70$, and the constant values for β and v, getting $t'' = 1337/3 = 445\frac{2}{3}$ for the reading of John's clock at K'' at the time of the transfer; and then we substitute $x = 0$, $t = 140$, and the constant values for β and v, into the same transformation-equation and get $t'' = 1400/3 = 466\frac{2}{3}$ for the reading of John's clock at K'' when it arrives at A. Thus John's clock has advanced its reading by 21 seconds in going from P to A. Peter's clock, having the reading 21 on the transfer, and advancing its reading *pari passu* thereafter with John's, has the reading 42 on Peter's return to A.

equal distance along Peter's. Let Peter be transferred when he has arrived at P, and Paul when he has arrived at M'. Each is thus transferred to the other's platform when he is 21 seconds old physiologically. When they meet, each is 42 seconds old physiologically.[11] Thus the equal accelerations undergone by the two babies under similar kinematic conditions, and under the assumption that these accelerations have no disturbing effects, bring them back to each other with equal physiological ages.

* * * * * *

Let us now in terms of years instead of seconds tell the story of Peter and Paul moving relatively at the furious speed of 177,425 miles a second on their unaccelerated platforms.

'Peter at the physiological age of 21 years, on January 1, 1921 (by his calendar), was passing one of Paul's "coeval" cousins at Q (born simultaneously with Paul by Paul's calendar). This man was at that time 70 years old physiologically; for he was born on January 1, 1900, by Paul's calendar, and his heart had been beating once every second by Paul's clocks; and now it was January 1, 1970, by Paul's calendar. Peter had been told some ten years and nine months ago[12] that news had been received of the birth of this cousin of Paul's as having occurred on September 1, 1687, by Peter's calendar. This man therefore was 233⅓ years old by Peter's calendar when Peter was

[11] Let us work out the answer algebraically, and then apply the answer to our arithmetical set-up. Let v be any positive constant less than c, and let n be any positive constant. Peter, having been at $A(x = 0)$ at time $t = 0$, reaches point $D(x = n)$ at time $t = n/v$ by Paul's clock there, and Peter's clock has then the reading $t' = \beta(t - vx/c^2) = \beta(n/v - vn/c^2) = n/\beta v$. His clock is therefore at that time slower than Paul's clock at D by $n/v - n/\beta v = n(\beta - 1)/\beta v$.

Paul, having been at A' at time $t' = 0$, reaches $E'(x' = -n)$ at time $t' = n/v$ by Peter's clock there, and Paul's clock then reads $t = \beta(t' + vx'/c^2) = \beta(n/v - vn/c^2) = n/\beta v$. His clock is therefore slower than Peter's clock at that time by $n(\beta - 1)/\beta v$.

The points D and E' pass each other at time $t = t' = n(\beta + 1)/\beta v$, this being the reading of the *indigenous* clocks at D and E'. We get this result by substituting $x = n$ and $x' = -n$ into the Lorentz equation $x' = \beta(x - vt)$, and solving for t; and then into the Lorentz equation $x = \beta(x' + vt')$, and solving for t'.

Since the transferred clocks are slower, each than the indigenous clock beside it, by $n(\beta - 1)/\beta v$, both, on passing each other, have the reading $n(\beta + 1)/\beta v - n(\beta - 1)/\beta v = 2n/\beta v$. Since the heart-beats of Peter and Paul have been running off in the rhythm of their clocks, they are both $2n/\beta v$ seconds old in passing each other.

If now we substitute for n the value $7c\sqrt{91}$ and for v and β their respective numerical values in our set-up, we get the readings of the transferred clocks, on their passing each other, as being 42.

[12] The reader is now probably able to work this out for himself.

passing him. Peter was astonished to see this man still alive, in spite of his nearly twelve-score years—he surely looked like a mighty fine specimen of a super-bicentenarian. Peter could not understand it, for in the life-time of this prospective Methuselah the fountains of youth had run completely dry. There was something devilishly queer about it all; for now that he came to think of it, he had passed several other men who were said to be very old but looked quite otherwise. He began to wish that he knew the secret of living two and one-third centuries without showing the ravages of labor and sorrow; he even had the passing wish that he had been born on the other platform, where age sits so lightly on the sons of men. However, being 21 and in love, he gave these matters only a moment's thought; there were other things more important.

'Paul's cousin, on his side of the anti-friction clearance, was likewise puzzled. He had learned, some three years and three months ago,[12] of the birth of Peter as having occurred when he himself was born, and he had lately been kept informed by the *Daily Platform* of Peter's rapid approach. When Peter did whirl by, he could not believe his eyes. Instead of being a septuagenarian like himself, Peter proved to be a remarkably handsome lad, not more than 21; he must have resorted to goat-glands or hormones or whatever it was that in 1970 had long been noised abroad as effective antidotes for old age. Whatever it was, he himself had not found it effective in his own case; the practitioners had taken his money and left him his years. Perhaps he had been born on the wrong platform; on the other, youth-preservers must be more potent! Having heard of relativity but not knowing more about it than that it proposed rapid travel as the way to keep from growing old, he now suspected that it must be true. Finally in a mood, mixed of high resolve and desperation, he jumped over to the other platform, where under the ministration of relativists he might get the benefit of speed for the rest of his days.—And that was the last seen or directly heard of that cousin of Paul's. Neither hide nor hair of him could be found.

'Peter, however, soon thereafter got word by wireless that there had been a terrific platform-quake some way down the line. Coming so soon after the passing of Paul's cousin, so old and yet so spry, this news set him a-wondering whether there might not be some connexion between the strange events that were taking place in his neighborhood. The miracle that had transformed a man over 233 years old into a sprightly though gray-haired buck might account for anything else. He bethought him of the accountant he had heard of as a very learned

man, and betook himself to him and introduced himself as Paul's "coeval". He now remembered that word, and one thing leading to another he asked for news of Paul. He was told that Paul was probably getting along splendidly; he must now be getting his first molars, for he must be over six years and three and a half months old.[12] This competely bowled him over; he was done with this accountant and all his ilk. He set out hot-foot for Hannah, who soothed him by promising to keep her world-line always as close to his as possible in this new Space-Time which people were beginning to talk so much about.'

This is the authentic story of the Paradox of the Time-Retarding Journey in the Special Theory of Relativity, as told by relativists in the privacy of their nurseries. All my relativistic friends tell me that at bedtime their children cry for it, and when they get it they "just lap it up". Like all children, they know by heart the stories repeatedly told them; and when a father, just to tease his little ones, mixes up the ages of Peter and Paul's cousin, they shout the correction in unison of protest. I am afraid that in any of these nurseries Lovejoy's story would provoke a storm of derision. Just where he picked it up I do not know. He is certainly correct in speaking of it as "pleasing"; but why did he call it a "pleasing *relativistic Märchen*"?

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ON NEGATIVE FACTS

I shall argue in this paper that logic may dispense with negative facts. By a negative fact I mean whatever would make a negative proposition true and yet could not be reduced to any positive fact, *i.e.* to a fact expressible in terms of an affirmative proposition. In denying the necessity of negative facts in logic I do not deny that negative propositions are significant and essentially different from affirmative ones.[1] Nevertheless it may be shown that these negative propositions are true in virtue of some positive fact or other.

Though I cannot prove that there are no negative facts I may mention the following general consideration which prompts my disbelief in their existence. Their existence would imply that there is

[1] That there are essentially different propositions which are true in virtue of the same fact may be seen from the following example. The propositions 'this is green' and 'this is colored' may be based on the same fact of the existence of a certain green patch. But they are significantly different, since the understanding of 'this is colored' does not entail the knowledge of the other proposition.

an actual infinite. For whatever is a fact is actual. And there is no limit to negations about any entity. Therefore if each negation expressed a negative fact there would be an infinite number of such facts about any entity. But it is hardly believable that each finite entity is accompanied by an actual infinite. The notion of an actual infinite is likewise very doubtful. Indeed one may define actuality as limitation of possibility. So much metaphysics for my distrust in negative facts, but now let us turn to purely logical considerations.

In the first place let us divide all negations into two main classes, A and B. The class A will consist of propositions which deny that an entity has some character or relation. The class B will contain those propositions which deny the being of an entity regardless of what its properties might be. The propositions of the first class may be called *predicative negations*, those of the second *pure negations*.

To begin with the class A. Though there are different kinds of predicative negations I shall select as a representative of the whole class the sub-class of subject-predicate negations directly about particulars, *i.e.* containing particulars as constituents. 'This is not round', where 'this' functions as a proper name, is an example of my representative propositions. I take them to be representative because I believe that the argument against negative facts which I shall propose in connexion with them may be applied *mutatis mutandis* to any other kind of predicative proposition.

In fact my argument is based on the familiar consideration—which has been advanced in connexion with various kinds of propositions—to the effect that negating a predicate P of a subject S is equivalent to attributing to S some disjunction of predicates other than P. If I restrict this consideration to negations directly about particulars it is because I wish to bring it, for the sake of greater precision, in connexion with W. E. Johnson's *Principles of Adjectival Determination*.[1] According to the *Principle of Adjectival Alternation* the particular "*s* must be either not-P; or *p* or *p'* or *p''* . . . continuing the alternants throughout the whole range of variation of which P is suceptible —*p*, *p'*, *p''* . . . being comparatively determinate adjectives under P" (which is a determinable). If one of the alternant determinates, say *p*, be denied of *s*, then the denial is equivalent to the disjunction of the remaining alternants under P, *i.e.* to *p'* or *p''* or *p'''*, etc. This would dispense with negations (and therefore with negative facts) but for the assumption that *s* may be 'not-P'. This assumption, however, may be analyzed in its turn. For what could the predicate

[1] *Logic*, Vol. I, pp. 237 ff.

'not-P' mean? If it were another determinable, then in virtue of the *Principle of Adjectival Counterimplication* there would be an absolute determinate under it characterizing *s*, and the fact of this characterization would be a positive fact. But 'not-P' cannot be a determinable since it cannot be resolved into a disjunction of determinates. Nor can it be a determinate, for in accordance with the *Principle of Adjectival Implication* if 'not-P' were a determinate it would belong to some determinable; but no determinable can have negative determinates. It follows that 'not-P', being neither a determinable nor a determinate, is, as Johnson puts it, "not properly speaking an adjective at all". He calls it a *pure* negative and leaves the matter here. But the important conclusion which should be drawn from this analysis is that 'not-P', being not an adjective, cannot be used as a predicate, since only adjectives can characterize something in a subject-predicate proposition. In fact, attributing a *pure* negative to *s* would be another way of saying that it is indescribable or not characterizable. But I think it may be safely taken as an analytic proposition that any particular (existent) is something describable and characterizable. The difficulty can be avoided only if '*s* is 'not-P'' is taken to be a non-predicative proposition. For example one may suggest that it does not attribute to *s* the 'predicate' 'not-P' but simply denies that P has an application. This suggestion brings the proposition concerned under the class B, and will be discussed presently. But before entering the discussion I must answer two objections which the argument at this stage is likely to provoke. The first is that the resolution of a negative proposition into a disjunction does not eliminate the negative element because each alternant of this disjunction is presumably *other than* the remaining ones. But to be *other than* something else is the same as *not to be* something else. Thus the expression 'other than' obviously contains negation. This, I believe, is true. And I am also ready to admit that the assertion of otherness is not reducible—in the way in which a subject-predicate negation is—to an affirmative disjunction. Otherness of entities is a fundamental logical relation already presupposed by any subject-predicate proposition. But this fundamental significance of otherness does not mean—I should answer the objection raised—that otherness expresses a negative fact. The facts underlying statements of otherness are positive; it is the case of a plurality of entities as given against the same background. There is nothing negative either in the entities themselves or in their background. When for example I have two trees in the field of vision I may say that one is not the other; but this

saying could not endow either tree with negativity. The otherness of these trees could be *shown* in positive terms by naming them. And to insist that each name is not the other would mean—as Wittgenstein proved—an incapacity to understand the significance of symbolism.

The second objection is concerned with the comprehensiveness of the disjunction. It is as follows. When a negation is said to be equivalent to a disjunction, this disjunction must be, of course, exhaustive. But an exhaustive enumeration of alternants implies the fact that *there are no others;* and this fact seems to be negative. This objection I shall meet, first, with a qualification; an exhaustive enumeration of items need not always be supplemented by a statement that there are no others. One may be certain that they are all enumerated on the basis of an immediate apprehension. In such case the very possibility of others may be excluded, and, therefore, their absence need not be mentioned. For example, if I know that there are only five seats in my room, and if I see that they are all occupied, I may assert that the number of persons seated in my room is five; I simply could not imagine that there may be more. Another example is the answer to the question 'How old are you?'. We should never receive such an answer as 'Thirty years *and no more*'. In general, whenever there is a closed field either filled up with items or occupied with such a number of items as is subject to immediate inspection, the statement that there are no other items would seem to be redundant.[3] In all other cases, one may argue, it would be likewise possible to dispense with negation, provided the field of enumeration could be apprehended at one glance. That in fact such immediate apprehension is not always possible would point to human limitation rather than to the necessity of negative facts.

That the proposition 'there are no others'—regardless of whether it is indispensable or not—does not express a negative fact may be seen more directly and conclusively from its logical analysis. This leads naturally to the discussion of the class B, since the proposition concerned is not predicative, but is merely a negation of others.[4] I

[3] Consider the ultimate totality (if there is such a thing) of the world as describable. This may be said to consist of all facts, either positive or negative (if any). That these facts are all does *not* imply the negative fact that there are no others, for such a fact would be another (*i.e.* over and above the totality of facts). This argument, however, cannot be decisive, because the totality of facts may be illegitimate.

[4] One might suggest that the denial of existence is *predicative* because it is equivalent to the negation of the predicate 'existent' (or of some other predicate of being). Accordingly 'S is not' would be equivalent to 'S is not an existent'. But this is not so. For, as W. E. Johnson has shown, the meaning of 'is' in the proposi-

shall symbolize such negation by 'S is (or are) not', where 'is' will be conventionally restricted to existence. Though in different contexts 'is' may mean different kinds of being, I may use the same argument *mutatis mutandis* in connexion with all these meanings. One might expect—taking the proposition 'others are not'—that S might stand for a particular as a proper name. Then the proposition 'S is not' would be directly about a particular. But this will not do. For if S were a proper name, the corresponding particular *would exist* as a constituent of the negation. Hence this negation should be discarded as self-contradictory. That is, if the proposition 'S is not' is possible, the symbol S cannot be a name of a particular. But it can be a *description*. On this interpretation 'S is not' means that 'the so-and-so is not', where 'the so-and-so' is the description symbolized by S. And this denial of the description cannot mean that the description does not exist as a description. It does not exist in the sense that it does not describe anything, *i.e.* has *no application*. Yet the statement that a description has no application is elliptical. It must be completed by specifying what exactly is the entity to which the description is not applicable. And whatever this entity may be, the important point is that it must be a particular, since a description is not about itself.[5] Thus to say that a definite description has no application is equivalent to saying that there is a particular which is not described by the description concerned with it. This statement entails, in its turn, that there is another description which excludes the first and applies to the particular. For example, if, pointing to a mirage in the desert, one says that this oasis is unreal, one does not deny the reality of what the word 'this' demonstrates, but merely that the description of a certain real oasis is applicable to it. And this denial is based on the fact that another description incompatible with the first is properly applied to the phenomenon. Hence the negation of a description, when analyzed, turns out to be a predicative negation. In other words propositions of the class B may be reformulated as propositions of the class A. For all propositions of the class B are about definite descriptions of various degrees of complexity. Each of these complex descriptions consists of a conjunction of simple characters, say *pqr*. . .

tions 'S is' or 'S is not' depends on the category of being to which S belongs. Hence if, for example, 'is not' means 'does not exist' it does so because S belongs to the category 'existent'. Thus 'existent' must be affirmatively predicated of S regardless of whether S exists or not. A similar argument may be used concerning any other category of being.

[5] Of course there may be a description of a description. But even so, this second description must be given as a particular entity to be described.

which belong respectively to different determinables P, Q, R. In denying such a description one maintains that the corresponding particular is either not-*p* or not-*q* or not-*r*. . . .Taking these negative predicates in turn one may resolve each of them into a disjunction of the remaining positive determinates under the appropriate determinable. It follows that the problem, as well as the solution, of pure negation, is, at bottom, the same as the problem, as well as the solution, of the predicative negation. The conclusion is that if negative facts are dispensable in the case of predicative negation they must be likewise dispensable in that of pure negation.

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REVIEWS OF BOOKS

The Intelligible World. Metaphysics and Value. By W. M. URBAN. The Macmillan Company, N. Y., 1929. Pp. 480.

For several decades Professor Urban has been recognized as one of our most distinguished writers on the general theory of value. In this book he gives us the metaphysical conclusions based thereon. There is little discussion of his own theory of value; for that the reader must turn to the book on *Valuation* of 1909, or to the articles on the logical aspects of value published in 1916 and 1917. It is unfortunate that the author has not expanded his logical studies about value into a volume on the subject.

I shall give a brief summary of the book, without much criticism, and then a few controversial points will be discussed.

There are two kinds of philosophy. One kind, which Mr. Urban accepts, and which he calls the grand tradition or perennial philosophy, finds that the world is "ultimately meaningful and intelligible". This intelligible world is in some sense "beyond" the sensible and phenomenal. The other kind of philosophy, which is called modernism or minute philosophy, denies these doctrines. It is "a party of more or less organized opposition" (p. 1). The grand tradition is idealistic; but not in the epistemological sense of the term, because it has always been above the battle of realism and idealism. The basis of perennial philosophy is the doctrine that value and reality are ultimately inseparable. To divorce them can issue only in unintelligibility (pp. 2–3). "To be philosophically orthodox is to understand and acknowledge those fundamental forms of reflective thought without which intelligible communication and interpretation are impossible" (p. 35).

Philosophy admits its presuppositions and acknowledges their necessity. The ultimate postulate of all thought and knowledge is "the possibility of intelligible communication" (p. 46). Presupposed in this are the three beliefs that "I exist and others like me, inhabiting a world" (p. 48).

There are three postulates which deal with the 'world' in which we live. The first is that the world is a unity, but primarily an axiological unity. "Any concept of totality that shall satisfy the demands of philosophy and philosophical discourse, must, accordingly, be one that includes the meaning and value of things as well as the things themselves and any merely logical unity of things" (p. 55).

A second postulate about the world is that it necessarily has a meaning. "The ultimate object of our thought is not abstract being unrelated to meaning and value, but meaning and value itself of which being is a form. Thought is not oriented towards absolute being but towards absolutely valid values" (p. 57).

The third postulate or axiom is "the identity of value and reality" (p. 61). "When we judge anything to be real or unreal we are not opposing a general class of unreal things to real things, but are comparing one particular reality with another, from which it ought to be, but in a certain judgment has not been, distinguished. But this demand for distinction is meaningless except as it presupposes distinctions of value and their acknowledgment." "For an ultimate reflection reality and value must be identical (or at least inseparably related), since the highest object of reflection is just the full ground and meaning of our judgments of reality" (p. 75).

Perhaps the central chapter in Mr. Urban's book is the fourth, on "Metaphysics and Value Theory". In it he briefly summarizes his own theory of value and then argues that the theory of value must be the foundation for philosophy rather than its conclusion. "It is no longer possible merely to write a chapter on value at the end of a philosophical treatise" (p. 133). No theory of value can be adequate if it attempts to define value in non-value terms. Value is a logically primitive concept. No object is value-free. Value is a unique form of objectivity. The predication of value attributes, not *being* in the sense either of existence or of subsistence, but worthiness to be. This worthiness to be is the "value-objective". Value is not an entity to be pointed to; it is a meaning to be acknowledged (pp. 134-147). Apparently the author accepts the Aristotelian dogma that if there is a better, there must be a best. Levels of value must be determined by a finite perfection. Only finite limits are intelligible. The possibility of an infinite scale of values is denied with the remark that "a pyramid without base and apex, a hierarchy without top or bottom, are obviously meaningless ideas" (p. 453). (The reviewer does not doubt that this remark applies to pyramids, but he wishes Mr. Urban would explain more fully why the universe must be like a pyramid.)

As Herbart said, logic is the morality of thought. Logic is a normative science, a science of those absolute values that must be acknowledged if intelligible communication is to be possible (p. 87). Logic gives us the form of intelligible communication, though it can never do more than give us the scaffolding of an intelligible world

(p. 103); hence it must be axiological rather than ontological. The reader is interested to learn (p. 121) that "language creates reality". Unfortunately the author has had to omit three chapters on the language of metaphysics, which might have thrown some light on this linguistic cosmogony.

The problems of epistemology and metaphysics are ultimately problems of value. But "the realm of validity is a highly rarefied atmosphere" (p. 155). "In the end we must all talk ontological language." But we must not think of objects as existing in their own right and incidentally possessing value. Their value is the very essence of their reality (p. 157). For willing and thinking the duality of value and existence is an indispensable condition. But by mystical insight we reach the "axiom of the inseparability of value and reality" (p. 159). Thus ontology is a roundabout way of solving value-problems (p. 161).

The first five chapters, which have now been summarized, give the basis of Mr. Urban's philosophy. The second part of the book, which makes about two thirds of its length, may be touched more lightly. In nine chapters on "The Return to Perennial Philosophy", he discusses many of the traditional problems of philosophy: intelligibility, space and time, origin and value, evolution, finality, progress, degradation, and system. Perhaps the following sentences best summarize the basic argument of the entire book. "All intelligibility ultimately goes back to intrinsic intelligibles. The only thing that is intrinsically intelligible, however, is a will oriented towards values. Intelligibility in its lowest and simplest form already presupposes communication, and communication presupposes acknowledgment of identical meanings and the values which these meanings presuppose. There is no type of meaning separable from value. The conditions of intelligibility are the conditions of intelligible communication, and the conditions of intelligible communication are the acknowledgment and retention of the meanings and values of things. To separate reality and value means unintelligibility" (p. 210).

The spirit of Mr. Urban's discussion of detailed philosophical problems is astonishly orthodox. A few examples must do. On page 216 he asserts, without any proof that I can find convincing, what he calls the axiom of derivation. "The more can not be derived from the less." The proof is that the "natural light of reason" tells us so. On the next page he adds a more interesting doctrine. "Causality and finality must be brought together in a more ultimate concept." But after much technical discussion, the culmination of this theory is

the following dogma. "Without the ideas of 'the one increasing purpose' and of an imperishable goal—yes, even the ideas of a climax of being and of a last judgment—it has been impossible to make any teleology intelligible" (p. 358). "The philosopher who finds a moral order, a meaning, in the universe is compelled by his logic to envisage a universe in which there is a last judgment of some sort, the triumph of good, the conservation of value" (p. 367). This discussion will doubtless be comforting.

I must confess that I find it hard to evaluate Mr. Urban's book. It has many significant discussions. It deserves to be read, but it does not seem to me to be convincing.

The day has passed when a philosopher should assume that his type of thinking is the complete truth. Mr. Urban divides all philosophers into two opposed camps, one of which "ought to be" and the other of which "ought not to be", if I may use his value-terminology. He seems to be unwilling to recognize any possible contribution by a philosopher who is in any degree "modernistic". Consequently his point of view, for better or for worse, is almost completely out of touch with contemporary movements of philosophical thought. Moreover, he seems to have no use for developments in any of the sciences. He does not admit that mathematics has made any contribution to the study of infinity. There can be no logic of relations except in the problem of quantity. Space and time may be discussed without reference to any recent movements in physics. The discussion of meaning may disregard nearly all recent empirical studies of the meaning of meaning. The perennial philosopher may permit himself to have "a certain absence of scruple" (p. 13).

The major thesis of the book is that value and reality are identical, or at least inseparably connected. In place of a detailed analysis of value-judgments, Mr. Urban makes a frank apeal to mysticism in support of this thesis. I have not been able to learn why such an argument should be used in a book on the intelligible world.

If intelligibility is sometimes defective, it is hard to understand how the concept of intelligible communication can prove so many things. If intelligibility were perfect and complete, some of Mr. Urban's theses might seem to be proved. But if our basic concepts are not completely intelligible (p. 468), then it is not clear that the fact of partially intelligible communication can prove all that he thinks it proves.

In spite of the criticisms which any reviewer tainted with some slight modernism might express, Mr. Urban's book is an important one. It is significant as an exhaustive attempt to place the theory of value in

the foundation of theoretical philosophy. His arguments in support of the thesis that logic, epistemology, and metaphysics, must be approached as studies of value, deserve careful consideration. Even his extremely orthodox metaphysical conclusions have the unquestionable merit of showing the connexion between these conclusions and their value-premises.

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The Philosophy of Art. By CURT JOHN DUCASSE. New York, Lincoln Mac Veagh, 1929. Pp. 314.

In the 314 pages of this book Professor Ducasse has packed so great a wealth of observation, analysis, and opinion, that he has made the task of any reviewer who would keep within decent limits of space exceedingly difficult. It will be necessary therefore to confine the discussion of the volume to the chief theses presented. These theses are developed with the lucidity of thought, and are expressed in the sprightly style, characteristic of Professor Ducasse's writing. In my own opinion, the great merit of the book consists in the clear-cut statement of issues, and, although I have found myself frequently taking a side opposed to the author's, I have almost always found it necessary, in maintaining the counter view, to clarify and strengthen it in my own mind, and for this I am personally grateful to him. I believe that other readers who may dissent from him will undergo the same valuable experience.

The book falls into two parts. The first, comprising chapters I to VIII and the Introduction, presents an outline of the author's view and a criticism of other views which are thought either to foreshadow his own view or to stand opposed to it in some interesting way. The second part, from chapter VIII on, states the author's theory of the essential nature of art more fully and precisely, and analyzes the æsthetic attitude, the æsthetic object, the æsthetic feelings, the æsthetic values, and the problems connected with the standard of taste. No one can fail to be impressed, in reading this second part, with the sharpness of Professor Ducasse's thought, which impels him to make distinctions for the expression of which he finds it necessary to invent a new terminology, barbarous no doubt, but destined perhaps to prove useful,—*autotelic, endotelic, ectotelic, lectical, heuretic, peripathic perception* (see the table on page 133), etc.

His theory of the nature of art is a variant of the expression-theory, which he traces to Véron and Tolstoi. (A much earlier source was

Condillac, *Essai sur l'origine des connaisances humaines, seconde partie, du langage et de la méthode*, 1716.) Expression is defined as skilled, that is, conscious or controlled, self-objectification, of which there are three varieties, lectical art, the conscious objectification of meanings; heuretic art, the conscious objectification of volitions (as in inventions); and æsthetical art, the conscious objectification of feelings. The result of expression is the creation of something—which may be in image-stuff or in perceptual stuff—"(1) capable of being contemplated by the artist at least, and (2) such that in contemplation that thing yields back to him the feeling, meaning or volition of which it was the attempted expression". In æsthetical art the feeling finally expressed is not usually in the artist's mind at the beginning, but develops step by step; the important questions for the artist regarding this feeling being whether, in the end, his work expresses his intention, and whether he is willing to stand by it, to own it as still a part of himself,—its *signability*. Æsthetic contemplation, the activity correlative to creation, is defined by the striking phrase "listening with our capacity for feeling", and is called by a new name, coined on the analogy of empathy,—*ecpathy*, the extraction from the work of art of the feeling which it embodies. The feelings embodied in a work of art may be of any sort, and are, in fact, of limitless variety, utterly transcending the range of our few feeling-names, for each feeling is an individual, while our feeling-names, such as they are, are only of kinds. Æsthetic contemplation is a different activity from æsthetic creation, as different as reading is from writing.

The further development of Professor Ducasse's view leads him to maintain two very questionable theses: that artistic expression has nothing whatever essentially to do with communication, and that the artist does not aim at beauty. With regard to the first matter, the facts lead him to admit a great deal that would seem to most people, I fancy, conclusive evidence against him, for example, that (page 34) "language as it is today has thoroughly built in the possibility of functioning as an instrument of communication". But this, he maintains, is only a possibility, and the essence of language, including art, is mere expression, not communication. With regard to art at least, the real point at issue is, I should suppose, whether or not the artist and the 'listener for feeling' regard the work of art as something *intended* to be shared. That both do, as a matter of fact, appears to me to be undeniably true. I know, of course, that painters will sometimes inform you that they do not care whether anyone sees their pictures or not, but at the same moment they are showing them to

you with great gusto, just as Amy Lowell used to tell her audiences that she was not at all interested in having people read her poems, —and then went on reciting them! And how false it is to separate the artist's interest in communicating and exhibiting his work from the artistic impulse itself, as if the art-impulse were a simple matter, instead of being, as it is, a highly complex pattern of impulses! How, I wonder, would Professor Ducasse account for acting in terms of mere self-expression without communication? On the other hand, he is certainly right in maintaining that the artist never creates solely to infect other people with his feelings; if his work is genuine art it must have value for himself in the first place; what he seeks is to *share*, not merely to *give*.

With regard to the second point, my first comment is, How perennial these problems are! I cannot forebear recalling Goethe's apostrophe to Strassburg cathedral, *Von Deutscher Baukunst*, 1773, where, as a young man, he says "diese charakteristische (that is, *expressive*) Kunst ist die einzige wahre", and then his *Der Sammler und die Seinigen* (1798), where he rejects his earlier view in favor of Beauty. But let us consider the matter briefly and in the author's own terms, putting aside all the many definitions of beauty (carefully, if not always adequately, distinguished by him) irrelevant to this issue, and asking ourselves whether it is true, as he asserts, that the artist does not aim at beauty, that is, at producing a feeling that is finally pleasant, but merely at self-objectification. My own answer would be a decided negative, for the reason that the complete artistic fact is not the mere objectification of feeling (consider the bearing of the single factor of design) but the creation of a value. The artist may begin to create under the urge of an unpleasant feeling, but what he aims to come out with is a pleasant one. How, in this case, he succeeds in doing so, is one of the traditional problems of æsthetics. Of course his work may not please a given spectator, in which case there is something wrong either with the artist or with the spectator; but whether it does or does not please the spectator is beside the point; the only relevant matter is whether the artist aims at beauty or not. If art were mere automatic expression, like a cry or a blush, I could understand how one could maintain that he does not; but if, as the author so rightly holds, it is controlled expression, it is difficult to follow his argument.

It was largely through reflecting upon the fact that art is a creation of a value that I was personally lead (in my *Analysis of Art*) to develop a theory of art which, while retaining much of the expression-theory, marks what I believe to be an advance upon it. And since Professor

Ducasse has done me the honor of devoting a chapter to the discussion of my view of art as 'an imaginative satisfaction of a wish' I may perhaps be pardoned if I make a brief reply to the points which he urges against me.

These points are essentially three,—that imagination is not of the essence of art; that this is plainly shown by the arts of music and the dance, since they do not simulate reality; and that art is not the satisfaction of a wish, but the expression of a feeling. In arguing the first point, Professor Ducasse tries to show that I use the term 'imagination' in two senses, first in the ordinary sense of imagery, and second in a peculiar sense, which he calls "arbitrary and impermissible", in order to include expression in perceptual stuff, where it is obvious that expression in image-stuff is out of the question. My reply is that by imagination I mean essentially creative activity, or more at length, the satisfaction of desire through the creation of 'substitute' objects and experiences, rather than by the usual process of adaptation to the environment and utilization of real things there. Such 'substitute-objects' are most obviously exemplified by image-objects, as in the dream by day or night, where the process of creation and the satisfaction of desire are evident, and in my *Analysis of Art* I tried to prove the imaginative character of most types of works of art by showing in some detail that they have the *status of images*. In music and the dance, on the other hand, I myself called attention to the fact that expression occurs in perceptual stuff, yet at the same time I insisted that even these arts have the essential character of imagination; that is, they are satisfactions of desire by means of freely created substitute experiences. And I would say in my defence that if this wider use of the term 'imagination' is "arbitrary and impermissible", then the use of the term by artists and critics for the last two hundred years and more is equally "arbitrary and impermissible", for I am but following in their footsteps.

As to the second point, there is, of course, no simulation of reality in music or the dance; yet both, I would insist, possess the 'as-if' character essential to imagination. Since the author's criticism centers around my discussion of the dance, I will recur to it specifically. I wrote, "For the moment it is 'as if' she (the dancer) were having her way through action within her own self". Upon this Mr. Ducasse comments, "she is *really* having her way. Her impulse at the moment is to make certain movements, and she really does make just those movements. There is no 'as if' about it at all." My reply would be that if that is all there were to the dance, it would not be an æsthetic

experience, but mere exercise. It becomes art only when the dancer feels—or when we who watch her feel—*as if* she were having *all her way* (which is, of course, what I meant and what I believed was perfectly clear), that is, *as if* she were satisfying, not merely her impulse to make just such movements, but countless other impulses—almost her whole self, in fact—as well. In other words, again, the dance, if it be an æsthetic experience, must provide a 'substitute satisfaction' of desire, even as music most obviously does.

As to point 3, I confess to some difficulty in seizing the author's argument. He is puzzled as to what wishes I suppose to be satisfied in the work of art. But is it not clear that all wishes may be so satisfied, even those connected with eating and drinking, as so much of Dutch painting in the seventeenth century attests. It will not do to say that these wishes are sublimated rather than satisfied, for sublimation is a kind of satisfaction or it is nothing. Mr. Ducasse taxes me with (inadvertently) admitting that feeling, rather than a wish, is expressed in art, by quoting many passages from my book where I refer to works of art as embodiments of feeling. I have to acknowledge that these passages are there, as he quotes them, but I would deny that they prove any inconsistency in thought, for the reason that feeling always presupposes desire. Perhaps I should have made this plainer. You can separate, in thought, desire from emotion, but they are not separate in fact. Fear, for example, depends upon an impulse or wish of avoidance. Desire lies deeper than feeling or emotion; hence it is only when we have found the roots of art in desire rather than in feeling that we have fully understood art. Not the mere objectification of feeling, but the creation of experiences through which desire finds a kind of satisfaction analogous to the satisfaction it finds in the dream, is the fact of art, and the ground of its importance for artist and 'listener'.

I have taken so much space for this rebuttal, that I fear I have little left for the consideration of the author's criticism of other writers,—Plato, Marshall, Dewey, Croce, and the adherents of the 'play-theory'. This criticism seems to me usually keen and well directed. I have, however, two comments. I do not think Mr. Ducasse does justice to the element of truth in Croce's equation of intuition and expression (language); for, while they are certainly not identical, it nevertheless remains true that all intuition involves a characterization and organization of impressions which probably never occurs apart from 'inner speech' of some kind. My other comment is that, in his discussion of the play-theory, he should have considered Lange. One of the most arresting discussions in the book is the rather detailed analysis of

Einfühlung, but I cannot help wondering why, since so many other representative theories of it were considered, Lipps's was not. The discussion of the various types of æsthetic experience, such as the sublime, comic, pretty, and so on, is rather sketchy; compare it, for example, with the thoroughgoing treatment in Volkelt's *Aesthetik*, Vol. II.

If I have dwelt at length on those points in *The Philosophy of Art* where I feel that its author's treatment is wrong or inadequate, I have done so because I have found the book of the sort that does not permit of neglect, and that challenges the reader to take a definite stand for or against.

DeWitt H. Parker

University of Michigan

Scientific Method in Æsthetics. By Thomas Munro. New York, W. W. Norton & Co., 1928. Pp. 102.

The author states in the preface that this book, which is to touch briefly on a considerable variety of æsthetic, critical, and educational problems, aims "to suggest in regard to each the implications of an experimental attitude; to indicate the bearings of recent developments in philosophy and psychology; and to show how all these problems could be dealt with in a comprehensive program of research". The four chapters of which the book consists deal respectively with Experimental Æsthetics, The Analysis of Form, Æsthetic Psychology, and Valuation and Value-Standards.

Æsthetics, the author declares, has been and still is a branch of speculative philosophy rather than a science. Only of late has there been any attempt to put it on a genuinely experimental basis, by applying to all its problems the method which has been so fruitful in the natural sciences. This method "consists, essentially, in observing concrete phenomena, comparing them so as to find their resemblances and differences, forming hypotheses to explain their causes and regular recurrences, and testing these hypotheses by more observation of or experiment with concrete facts" (p. 16).

Æsthetics is at one place characterized as "a study of recurrences and variations in human behavior towards works of art" (p. 21); and the comments made upon works of art by professional and lay critics should therefore be its starting-point. Indeed Professor Munro regards the distinction between æsthetics and the criticism of art as an arbitrary one (p. 25).

Criticism in recent times has become increasingly descriptive, and this in two ways: one, that of attention to the analysis of form, and the

other, that of the study of the psychology of the appreciation and creation of works of art. The analysis of form requires, beside attention to and discrimination of the element of arrangement, the possession of an adequate list of descriptive adjectives. These are to be collected from the literature of criticism, and may each be allowed to mean most anything, since the more scientific view of definition is that there is no one right definition for a word (p. 46).

Questionnaires embodying lists of suggested critical terms for application to some specific work of art will be valuable devices for the obtaining of data regarding the analysis of form. Such data can then be compared and used as bases for generalizations permitting probable predictions of responses to works of art of specified types. Similar methods for the collecting and collating of data will lead to generalizations concerning the psychological factors conditioning the creation and the appreciation of works of art. As regards norms or standards, the experimental attitude suggests that none can be laid down without prior observation of the activities they are intended to regulate (p. 81). The chapter in which standards are discussed emphasizes their relativity, but attempts to indicate a middle course between the old absolutism and the anarchy to which complete relativism is held to lead.

The book ill lends itself to summarization, for it may be said to consist almost wholly of exhortations by a minister of 'experimentalism' to those who would make æsthetics 'scientific'. It is hard in reading it not to be reminded of Bacon's *Novum Organum*, with, on the one hand, its clear grasp in the abstract of many of the principles of scientific method, and, on the other hand, the extraordinary futility of many of the suggested concrete applications of them. The author, moreover, appears to have remained experimental and tentative even as regards the nature and the function of 'æsthetics'; for it is hard indeed to decide just what, in his view, æsthetics is aiming at. In the natural sciences, the practical aim is control or anticipation of natural processes, to the service of man; but one wonders again and again to what use Professor Munro believes can be put the information which he says should be so painstakingly gathered. The reviewer is enough of a pragmatist to think that no matter how scientifically the grains of sand in a shovelful were weighed, measured, described and compared, the procedure would still be futile, or at best haphazard, unless some definite practical or theoretical end existed from the outset, the achieving of which required the obtaining of just those data.

C. J. DUCASSE

BROWN UNIVERSITY

New Realism and Old Reality; a Critical Introduction to the Philosophy of the New Realists. By D. LUTHER EVANS. Princeton, the University Press, 1928. Pp. viii, 214.

Professor Evans does not here pretend to offer a definitive exegesis, but only to introduce the student to the principal items of recent realistic polemic and of the opposition to it. If not exhaustive, the book is at least lushly documented from the more accessible sources. Its amiable affectation of euphuism, alliteration, and architectonic, its playful drama ("ably contend", "vigorously oppose", "deplore", "denounce"), and its unwearying stage-directions ("it will be instructive to note", "it must be said"), which apparently made the compilation tolerably interesting for the author, will make it an intolerably distracting sort of debate for only a few crusty readers.

Part One, "New Realism and Science", locates the roots of realism in relational and symbolic logic and in analytic natural science, and outlines the now notorious fallacies of speculative thought which the realist charges against his opponents.

Part Two, "New Realism and Philosophy", explains how the concept of substance is supplanted in realistic ontology by the "neutral entities", while cause is represented in realistic cosmology by the "evolutionary theory of creative synthesis". The central importance of realistic epistemology is recognized with a strangely incredible account of "neutral monism" and of the relational theory of consciousness. The American theory of mind as content is contrasted with the English theory of mind as act, and the scheme of critical realism is described as a mild antidote. In each case the author, relying especially on the writings of Professor Leighton, criticizes the realistic doctrine as itself speculative, equivocal, dogmatic, sentimental, or the like.

The third part, "New Realism and Religion", is made difficult to appraise by its frankly reiterated assumption that 'axiology' means the estimation of all theories concerning value according to their own value in consoling and encouraging people—a violation of Russell's "principle of ethical neutrality" which surely few realists would admit. Professor Evans describes the realistic doctrine of "Derivative Deity" (I quote his chapter-headings), and condemns it because it asserts only an ignobly finite God. He describes the doctrine of "Perpetual Progress", and condemns it because it asserts no grounds for serene faith but only for "desperate hope". And he describes the psychological theory of "Mechanical Man", and condemns it because it asserts that a person is not unique, important, and immortal! He

concludes with some commendation for the scientific and synthetic temper of realism, but offers as a better synthesis his own "realistic idealism" whose thesis is that "it is in terms of personality that the world as a whole should be interpreted". An appendix contains an index and a slight but neatly classified bibliography.

Some of us who are not ashamed of American neo-realism, in spite of its exquisite ingenuity and magnificent comprehensiveness, and who would sacrifice whole libraries of the shapeless contemporary syncretism to see *The Concept of Consciousness* in print again, will feel that it deserves something more solid and plausible than this, either in attack or in defense. We must be a little wary of an author, however amiable, who uses so oddly such words as "denotation", "subsistent", "substantistic", "mystical", "normative"; who would give us to understand that realistic logicians have no use for *classes*, that essences or neutral entities are incorrigibly "cold", "thin", and "ghostly", that neo-realists believe that mind and matter are "the miraculously parallel attributes of a substance . . . otherwise indefinable", that Alexander's Space-Time is a *totum simul* on all fours with Holt's logical absolute, that men like Holt, Perry, and Broad (for instance), are "mystical, quietistic, and aristocratic", and that Russell has no social gospel;—and who rather temerariously lumps together a good many philosophers who are somewhat diverse in their views, after all, in spite of their realism and their newness. Such an exposition must strike one often as extraneous and artificial, and the attendant criticism as sometimes irrelevant or frivolous.

In the main, however, Professor Evans achieves his own professed purpose. He gives us, for some interesting provinces of recent philosophy, a compact and sprightly guide-book in the modern manner of *So You Are Going to Belgium*. He escorts us to the right places, even if he does not always make the right speeches. Certainly he is to be credited with appreciating what are the two fundamental motives of most realistic philosophy—the eternalism of the logical interest and the progressivism of the biological—, and he recognizes the instability which results from an incompatibility of these motives. He sees that extreme logical realism may be as dangerous a pampering of man's intellectual requirements as absolute idealism can be of his moral *and* intellectual.

DONALD CARY WILLIAMS

UNIVERSITY OF CALIFORNIA AT LOS ANGELES

Poetry and Mathematics. By SCOTT BUCHANAN. New York, The John Day Company, 1929. Pp. 198.

A well-known mathematician of my acquaintance is fond of asserting that his attitude to his subject is æsthetic, that he regards mathematics as akin to music, that the structure of syllogisms, the neat devices of proof, the surprising turns and climaxes, give him an experience like that of enjoying the symphony of a master composer. Music is the higher art, he asserts. A symphony of Beethoven is unique; no one but Beethoven himself could have composed it; and had Beethoven never lived the symphony never would have been produced. But if a Pascal had failed to produce a given theorem in mathematics some one else at a later date would have discovered and published it.

This general kinship of mathematics and art is developed by Professor Buchanan in his highly suggestive treatise on *Poetry and Mathematics*. The æsthetic attitude which some mathematicians have towards their subject is revealed as something deeper than a mere personal peculiarity; the two apparently widely diverse fields are held to be developments of identical logical elements and processes. For the appreciation of this thesis the book must be read, and having been read it will repay re-reading and study. The author does not labor his thought, nor develop it in the usual controversial style, but takes for granted on the part of the reader a sense of humor and a quick intuition which grasps symbols without detailed explanation.

Both poetry and mathematics deal with ideas. It is bad teaching which gives the impression that mathematics has to do with formulæ and computations and stereotyped proofs. "A figure in geometry is the sort of thing that retains an identical character throughout a series of possible changes"—like Alice in Wonderland nibbling her mushroom, or like Hamlet, or Oedipus. Variation is change according to rule, such as the transformations in projective geometry, or the *action* of a play (in Aristotle's meaning of 'action'). The appeal to the imagination is the charm of both. A *number* is an element in a field of variation, the emphasis being not on the constancy of the element undergoing transformation, as in geometry, but in the order and connexion within the transformation, *e.g.* on the relations of before, after, between, successor, etc. The number-series is formed by a knitting process, or chain-stitch, beginning with the "primitive idea" *one* and the operators $+1$, -1, and x. In the drama or novel what corresponds to this knitting process is the weaving of the plot and the development of a pattern which gives the elements their significance.

The development of the notion of proportion (or analogy), and the discovery of functions or fluxions (flowing magnitudes), present new illustrations of the fundamentally identical dialect underlying poetry and mathematics. There is of course a difference between the two ways of dealing with ideas by means of symbols. "The mathematician sees and deals with relations; the poet sees and deals with qualities. Functions and adjectives respectively are the symbols through which they see and with which they operate." The symbols themselves, whether artificial signs or natural objects, are metaphors or analogies. They stand for ideas. Man, being a creature who uses symbols, may be described as an analogical animal. The drama and the novel, the highest forms of ancient and modern literature, combine the mathematical and the poetic methods. In them we have *relations* between *qualities*. In tragedy the action moves in the direction of expansion and integration of the idea (relations) in the midst of the piling up of circumstances which bring its collapse (qualities). In comedy the action proceeds less regularly by "wide variation and heterogeneous substitution". "Every turn in the action marks an inconsistency discovered, a plan gone wrong, a platitude rendered paradoxical, a principle disproved, a fact caught in duplicity." It is analogous to the process of trying out values and discovering the limiting values in a mathematical function.

This inadequate summary gives no indication of the engaging style, quiet humor, penetrating criticism, and scholarly erudition that characterize the treatment. One is inclined to agree with the author in the last pages of the book when he asserts that "Critical philosophy is the highest type of intellectual comedy, and Plato is the best comic poet of philosophy". We are pleased to find in our midst another comic poet of philosophy, of no mean ability, in the person of the author of this book.

E. T. MITCHELL

UNIVERSITY OF TEXAS

The Relation of Carlyle to Kant and Fichte. By MARGARET STORRS. Bryn Mawr, Bryn Mawr College, 1929. Pp. 102.

This interesting study is an attempt to determine to what extent Carlyle's thought was influenced by Kant and Fichte. For this purpose Miss Storrs makes a detailed comparison of certain of Carlyle's conceptions with those of the two philosophers.

The chief points in which Kant is supposed to have influenced Carlyle are (1) the doctrine of the ideality of space and time; (2) the

distinction between reason and understanding; and (3) the conception of the moral law. But a detailed comparison of the two thinkers shows that the resemblances between their doctrines are only superficial. (1) Kant's theory of the ideality of space and time is closely connected with mathematics and with his doctrine of categories; there is no evidence of such connexion in Carlyle's thought. Again, the notion "that the given world is, in part, the actual creation of the human understanding in the process of perception . . . remained foreign to Carlyle to the end" (p. 29). Further, the doctrine resulted for Kant in the distinction between the phenomenal and the noumenal worlds, but there is no indication of such dualism in Carlyle; for him there is only one world, and that spiritual. The significance for him of the ideality of space and time is mainly that it frees him from the "binding conceptions of materialism" (p. 31). (2) The distinction between understanding and reason, which Carlyle calls "the grand characteristic of Kant's Philosophy" (pp. 35 ff.), means something very different for the two thinkers. According to Kant, the understanding gives us valid knowledge of the world of phenomena, but the effort of speculative reason to extend its activity into the world of noumena is futile; in this latter realm, however, the practical reason gives assurance of God, freedom, and immortality. In contrast with this view Carlyle holds that the understanding, whose function is merely to make inferences from sense-data, cannot penetrate to the fundamentally spiritual nature of reality, but that reason, which he apparently regards as a "faculty for . . . intuitive perception" (p. 40), discovers this spiritual reality, and besides assuring us of God, freedom, and immortality, is the source of all genuine knowledge. (3) In moral theory the two thinkers agree in their opposition to hedonism and in their belief that conscience is a sure guide; but Carlyle does not, like Kant, regard "the moral law as a form of pure reason divorced from the phenomenal world" (p. 52), and also he believes, as Kant does not, that the authority of the law is based upon God's will.

As to Fichte, it is often said that Carlyle derived from him the belief in the ideal nature of reality and the conception of the world as the gradual realization of the Divine Idea. It is also maintained that Carlyle's conception of Heroes was markedly influenced by Fichte. Carlyle certainly knew at first hand Fichte's lectures on *The Nature of the Scholar*, but there is no evidence that he had any further direct knowledge of him, and much to indicate that he had no genuine understanding of his metaphysical theories. Like Fichte, he believes that there is *one* world, which is essentially spiritual; but his conception

of the outer world seems more like Berkeley's than like Fichte's. By the Divine Idea, of which he often speaks, he seems to mean the idea of the divine mind, expressed in the world. This is quite different from Fichte's conception of the ever-unattained goal of an active force which is gradually realizing itself in the world. Further, in his interpretation of history Carlyle has nothing corresponding to Fichte's five fundamentally different world-epochs, so intimately related to one another that we can predict the future by considering what would be the logical outcome of the past and the present; his much simpler theory is that history reveals the divine will and that thus the right will ultimately prevail.

Carlyle's doctrine of Heroes has little in common with Fichte's conception of the Scholar. Fichte, believing that knowledge of the details of the world-plan is essential to progress, maintains that all leadership—whether of ruler, teacher, or author—must be in the hands of scholars, and that in the scholar individuality is submerged in "the thought of the eternal" (p. 89). Carlyle, on the contrary, would say that moral and religious insight are more important for leadership than science and philosophy, and that it is precisely through his pronounced individuality that the hero is fitted to guide the race to higher levels. Some other comparisons that Miss Storrs makes between Carlyle and Fichte we must pass over for lack of space. She concludes that in the case of Fichte, as in that of Kant, Carlyle's knowledge of the philosophy was only slight and that its influence upon him was not profound.

Miss Storrs has written an excellent monograph. The work has been done carefully; and the mode of presentation and the clarity of the exposition are particularly to be commended. The interpretations of Kant and Fichte are sound in the main; and so far as my limited acquaintance with Carlyle enables me to judge she has made a strong case for her contentions. In one or two points the interpretation of Fichte might be called in question. For example, she accepts the rather common interpretation according to which the goal of the world-process is conceived as preëminently a *moral* one. Apparently, however, Fichte thinks of it as a unity of the subjective and the objective that includes all aspects of experience—intellectual and æsthetic as well as moral. Again, the interpretation of Fichte as teaching that the attainment of the goal would involve the disappearance of all individuality, while it has the support of some careful students of his philosophy, is of doubtful validity. At the very least one must say that it ignores the distinction that he makes between "sensuous

individuality", which is absorption in one's petty personal interests, and "ideal individuality", the uniqueness that characterizes every one who has surrendered himself completely to the Divine Idea.

ELLEN BLISS TALBOT

MOUNT HOLYOKE COLLEGE

Truth and the Faith. By HARTLEY BURR ALEXANDER. New York, Henry Holt and Company, 1929. Pp. vi, 314.

This is a brave and noble book. It is written by a philosopher, but it is not conceived in the usual line of philosophical treatises. It has more the note and ring of a prophet. It is not argumentative. It is rather a report of insight and vision, the announcement of deep convictions, a review and assessment of history and great biography, a confession of faith, and the mature fruit of much study, travel and reflexion. The author is convinced that truth that comes only from logical and mathematical approaches is but a fragment of the whole truth, and he is here striving to get the richer and more complex insights which are possible when one deals with life as revealed in man's supreme spiritual quests.

The book does not begin very happily or successfully. It rather puts the reader off, at least it had that effect on one reader. It requires patience to get into the mid stream of the author's thought, but from the first there are sanity and wisdom if one takes pains to penetrate into the heart of the somewhat abrupt and assertive paragraphs of the opening sections. The style improves steadily and the wisdom and sanity are more convincingly present as the writer gets settled into his task. His reading has taken a very wide range, but it has been thoroughly digested and the substance of it made a living possession of his mind, so that it comes back, not in quoted chunks, but as personal insight and conviction and breadth of judgment. His treatment of the Middle Ages is admirable. He works his way back into the life and mind of the men he interprets, and he succeeds in getting the inward feel of the period. Not less admirable is his treatment of the Renaissance and the Reformation. There have recently been numerous books written on the Puritans, and these stern old fighters have suffered much at the hands of easy-going modern critics. Very few writers have understood their spirit, or their discipline of life, better than Professor Alexander has done in his short but penetrating study of their contribution to the responsibilities that are involved in the possession of freedom.

He writes of the noblest art and literature of the fifteenth and sixteenth centuries as only one who knows them at first hand can do. Pascal, among others, receives careful study and is worthily interpreted, and his English contemporary, George Fox, is well done.

The book becomes a personal confession of faith and an acceptance of truth as it draws toward its close. It not only leaves the impression of sincerity and honesty, but, more than that, it strikes a note that any modern scholar may well ponder on and consider as a man's profound reaction to the deepest problems of life. Professor Alexander does not labor to find God at the far end of a syllogism, or to prove His existence by revamping ancient arguments, but, instead, he shows how the experience of human life in its deepest aspects, and faith in moral sanity and intellectual integrity, bring a vision and illumination of a living and triumphant Spirit, who is with us in our struggles and who completes our aspirations and our strivings. "Man is that kind of creature for whom *Truth* can be."

RUFUS M. JONES

HAVERFORD COLLEGE

The Nature of Deity. By J. E. TURNER. New York, Oxford University Press, 1927. Pp. 246.

In this book the author develops more fully the realistic evolutionary theism which he sought to establish by his earlier work, *Personality and Reality* (1926), the sub-title of which is, "A Proof of the Real Existence of a Supreme Self in the Universe".

The tendency of realists who are also theists is to look to the cosmological and teleological arguments for the basis of their theism—just as the Neo-Kantian theist depends wholly on the moral argument, and as the idealist who is willing to be a theist has recourse to the ontological argument. In Dr. Turner's proof of the Supreme Self the cosmological and the teleological arguments are combined. Three points are essential to his reasoning, all of which he derives from physical and psychological science, without introducing any "extraneous" philosophical or theological implications. First, the physical universe is an automatic mechanism. Second, it does something that is inherently impossible for an automatic mechanism—it evolves continuously and in a fashion that apparently has no limit. Third, personality is a type of reality which, by reason of inner unity and of the plasticity due to ideas and of an inherent dynamic quality, gains increasing dominance over and through mechanism.

Dr. Turner also makes much of the observation that mechanisms known to be the product of mind, when they become very complex—

as in a great business organization or an army—, tend to *conceal* the mind that creates them from any mind of a much lower order.

The author's conclusion is as follows: "The material universe, then, being in itself a mechanism which, as mechanism, *cannot* evolve, while at the same time it actually *does* evolve—and evolves, further, on the vastest of scales which seem to possess no final limitation—*necessarily* implies the real existence of a mind which so dominates the whole realm of matter as progressively to embody therein, by means of perfectly definite, unalterable, and indestructible mechanisms, its own constructive—if not indeed creative—ideas. Such a mind therefore is a supreme self—the personal factor of the psychophysical universe within which it is omnipotent" (*Personality and Reality*, p. 158).

It is not the thought of the author that the Supreme Self is shown by the foregoing reasoning to be divine. He has based his reasoning solely upon the physical sciences and psychology, and hence has established only that the Supreme Self is real and dominant. But by a parity of reasoning he infers from the universality of beauty that this Self is also æsthetic. As to the goodness of the Supreme Self no reasoning is required, according to the author. For no matter what ideal of goodness we may take, "it is itself the outcome and product of the evolution of the universe, or the manifestation of the Absolute, or the activity of the supreme self, as the case may be. It is this latter therefore that must form the ultimate standard of goodness, not any current concept however high it be." "Good actions are those that in any degree definitely advance the course of universal evolution" (*ibid.*, p. 187). Thus the Supreme Self necessarily possesses the attributes of deity.

But it goes with Dr. Turner's realism, and with the place that he gives to mechanism, that the Supreme Self cannot be identified with the Absolute. If we mean by the Absolute the all-inclusive Reality, God must be distinguished from it. He is "the supreme Reality rather than the all-inclusive; but obviously the two categories here involved are widely different" (*ibid.*, p. 171).

To the mind of the present reviewer there are serious confusions here. If one holds to the objective reality of 'moral tertiary qualities' one should be able to present some other and more decisive standard of goodness than universal evolution. And if one finds it important to make a distinction between the Supreme Self and the Absolute, how can one range 'the universe', 'the Absolute', and 'the Supreme Self' together as alike giving the ultimate standard of goodness?

Moreover, in consequence of the author's uncritical evolutionism there is in *Personality and Reality* no direct facing of the problem of evil, such as the argument requires. And this evolutionism naturally results in ethical relativism. "It may be said", the author writes, "that this leaves us with no final standard of good at all. But this is quite obviously true. No ideal that has ever yet been offered is final, if this means that this ideal cannot be further expanded and developed, and this in such a way that it becomes in the end radically transformed" (p. 188). When the author goes on to affirm: "Every individual therefore, as every age and nation, must have his valid standard of good", the word 'valid' begs the question.

The Nature of Deity, assuming the proof in the earlier volume, inquires whether further results can be gained concerning the character of the Supreme Self. The author's problem springs from "the inclusion of the Supreme Being *within* the universe". The problem is met by the affirmation that Deity is both finite and infinite. "As essentially personal, and therefore as so distinct from all other reals as to be transcendent, He is finite; not (that is to say) existentially identical with the Whole." But "the divine finitude which consists in self-distinction must never be severed from the infinity of absolute dominance, and so of absolute perfection. In this way every suggestion of a struggling Deity, imperilled by adverse forces which He may not succeed in finally overcoming, is altogether precluded" (p. 86). Thus a conception of divine transcendence is attained. To this is added a conception of immanence, but it is a "functional immanence" only. This is a forced use of the term, which makes it denote the instrumental relation between a mechanism and the self that controls it. The author says of Deity, "His relation to other reals is . . . strictly analogous to that between man and his own mechanisms" (p. 91).

When the author turns to the problem of evil, as he does in this volume, he acknowledges its reality, but he holds "that all evil ultimately becomes the instrument of good" (p. 205). First he points out that pain is a means of good, and then he applies the same reasoning to moral evil. "Just as the absence of pain means the cessation of all feeling, so the complete absence of wickedness would therefore imply the disappearance alike of individuality and of certain of the highest types of causation operating on the most extensive scale" (p. 108).

This instrumental view of all evil follows inevitably from Dr. Turner's position that all events are necessitated, not only on the level of automatic mechanism but on every other level. Contingency

is ruled out from every phase of the universe. "The entire material universe therefore, both living and non-living, is subject to that absolute necessity which characterises all its structures and governs all its processes; and thus it unmistakably expresses the literal supremacy of Deity." To this statement the author adds: "But this principle must now be carried still farther and applied equally to the immaterial or spiritual universe, *i.e.*, to the realm of consciousness and reason, of ethics and personality" (p. 176). In consequence of this position the freedom of personality, of which Dr. Turner makes much, means no more than self-determination, which in turn is absolutely determined. "The purpose of Deity . . . is unceasingly realised, although in fundamentally contrasted ways, throughout the entire universe" (p. 110). And under the "contrasted ways" must come the sum-total of evil.

The ultimate purpose of Deity, as defined by the author, "is the existence of reals capable of becoming more and more akin to Himself" (p. 120), and in this definition of divine purpose divine love is also defined. Moreover, in view of the reality of moral evil, divine love will manifest itself in atonement. The reader is likely to feel, however, that in interpreting atonement as "the principle of divine compensation" for human weakness or helplessness, the author has assimilated it to his evolutionism instead of grasping its profounder metaphysical meaning. The recognition which one finds in Royce's interpretation of atonement, that it bears witness to a tragic aspect in the Divine Experience itself without which the ultimate triumph of the good cannot be achieved, is wanting here.

The revival of the cosmological and teleological problems in philosophy, and the recognition that their solution is of importance for theism, is a welcome sign of the times, and of these tendencies Dr. Turner's writing is an important example. And his thoroughly psychical interpretation of human selfhood has much value. But these aspects of his thought are seriously limited by his unqualified acceptance of mechanism, by his uncritical evolutionism, and, in the judgment of the reviewer, by his absolute philosophical determinism. No account is taken of the criticism of mechanism by philosophical physicists, nor of their recognition that physical laws are statistical averages and that indeterminacy plays a part in physical phenomena. Similarly, no room is given to spontaneity and metaphysical freedom on the higher levels of existence. As for the Supreme Self as creator of the physical universe, the author writes: "The supreme activity must rather be compared to the action of the man who fires a torpedo

and then leaves it to direct its own course". "Creation is thus the primal action of the supreme self upon the self-evolving material universe" (*Personality and Reality*, pp. 181, 182). It would seem that Dr. Turner has given us the most thoroughgoing deism to be found in contemporary thought.

EUGENE W. LYMAN

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The Elements of Logic. By ROBERT LATTA and ALEXANDER MACBEATH. London, Macmillan and Co., 1929. Pp. vi, 394.

This is another textbook in elementary logic, but the treatment marks it as the work of a mature mind with an advanced philosophical position. The book was begun and more than half completed by Professor Robert Latta, Emeritus Professor of Logic and Metaphysics in the University of Glasgow. The task was interrupted by the war, it was postponed on account of the heavy administrative duties taken over by Professor Latta during those years, and its completion was rendered impossible by the subsequent impairment of his health. The work was completed by Professor Alexander MacBeath of Queens University, Belfast. In spite of the dual authorship the point of view is consistent throughout.

The book is obviously written in the tradition of Bradley, Bosanquet, and Joseph. The systematic interconnexion of the parts of the subject is very properly emphasized, and the discussions are overcast with a philosophical point of view which makes the writings of this group the joy of some students and the despair of others. In all discussions alternative points of view are very fully and fairly presented—so forcibly presented, in fact, that in some cases one is at a loss to understand why the authors are not themselves convinced. For example, after pointing out that the disjunctive proposition may mean anything from the complete exclusion of the alternatives to their complete identity, and that the argument which proceeds by the elimination of an alternative is always valid, and that the argument which proceeds by affirming one of the alternatives depends for its validity on the *conjunctive* part of the premise alone (Either P or Q *but not both P and Q*), they nevertheless conclude that the disjunctive syllogism must be interpreted as being based on exclusive alternatives. It is interesting to trace the difficulties which this interpretation places in their way when they deal with the dilemma, difficulties which they see plainly and discuss at length, but which they cannot avoid.

The nature of judgment and of propositions is discussed, and all important interpretations are considered, with the result that Bradley's

is adopted. The rather important question of the existence of the terms of a proposition is omitted, and with it is omitted the problem of particular conclusions from universal premises, and the corresponding questions of immediate implication.

Arguments other than syllogistic are treated at some length, and the nature of the relations on which they are based is discussed. The classification of relations (as transitive, symmetrical, etc.) is omitted, however, with the result that the treatment seems somewhat extraneous to the central point of view of the text.

The inductive part of the book shows less of depth than the earlier chapters, but is reasonably adequate considering the limitations of an elementary textbook. Clarity and fairness characterize the whole work. It is an interesting attempt to modernize the traditional logic. The exercises and illustrations are mostly new, forming a valuable feature of the book.

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The following books were received during the months of March and April, 1931:

Reason and Nature. By MORRIS R. COHEN. New York, Harcourt, Brace and Company, 1931. Pp. xxiv, 470.

The Logic of Science. By HAROLD R. SMART. New York, D. Appleton & Co., 1931. Pp. x, 238.

Some Problems in Ethics. By H. W. B. JOSEPH. New York, Oxford University Press, 1931. Pp. viii, 136.

Savonarola. By RALPH ROEDER. New York, Brentano's, 1931. Pp. vi, 308.

The St. Louis Movement in Philosophy. By CHARLES M. PERRY. Norman, University of Oklahoma, 1930. Pp. 152.

Vedanta or The Science of Reality. By K. A. KRISHNASWAMY AIYAR. With a Foreword by S. RADHAKRISHNAN. Madras, Ganesh & Co., 1930. Pp. xiv, 348.

Schopenhauer: Pessimist and Pagan. By V. J. MCGILL. Norwood, Mass., Plimpton Press, 1931. Pp. x, 312.

Science and First Principles. By F. S. C. NORTHROP. New York, The Macmillan Company, 1931. Pp. xvi, 300.

The Soul and Its Mechanism. By ALICE A. BAILEY. New York, Lucis Publishing Co., 1930. Pp. 136.

The Platonic Tradition in Anglo-Saxon Philosophy. By JOHN H. MUIRHEAD. New York, The Macmillan Co., 1931. Pp. 446.

Locke, Berkeley, Hume. By C. R. MORRIS. New York, Oxford University Press, 1931. Pp. 176.

Human Values. By DEWITT H. PARKER. New York, Harper & Bros., 1931. Pp. x, 416.

The Subject As Freedom. By K. BHATTACHARYA. Bombay, G. R. Malkani, 1930. Pp. viii, 206.

Scientific Inference. By HAROLD JEFFREYS. New York, The Macmillan Company, 1931. Pp. viii, 248.

The Field of Philosophy. By JOSEPH A. LEIGHTON. Fourth edition. New York, D. Appleton & Company, 1931. Pp. xii, 640.

A Crusade for Humanity. By JOHN EDWIN MCGEE. London, Watts & Co., 1931. Pp. x, 250.

The Person of Evolution. By W. D. LIGHTHALL. New York, The Macmillan Company, 1930. Pp. x, 216.

Studies in Philosophical Naturalism. By H. G. TOWNSEND. Eugene, University of Oregon Press, 1931. Pp. 60.

The Physical Basis of Rime. By HENRY LANZ. Palo Alto, Stanford University Press, 1931. Pp. xiv, 366.

The Works of Aristotle. Volume III (including the *De Anima*). Translated by J. A. SMITH and others. New York, Oxford University Press, 1931. Unpaged.

The Historical Evolution of Modern Nationalism. By CARLTON J. H. HAYES. New York, Richard R. Smith, Inc., 1931. Pp. viii, 328.

The World of the New Testament. By T. R. GLOVER. New York, The Macmillan Company, 1931. Pp. 234.

History of Greek Philosophy. By B. A. G. FULLER. *Vol. II: Sophists Socrates Plato. Vol. III: Aristotle.* New York, Henry Holt & Company, 1931. Pp. x, 494; viii, 372.

Le Judaïsme. By JULIEN WEILL. Paris, Félix Alcan, 1931. Pp. 242.

Une expérience religieuse. By MAURICE FOURRIER. Paris, Félix Alcan, 1931. Pp. iv, 226.

Montaigne. By FORTUNAT STROWSKI. Paris, Félix Alcan, 1931. Pp. viii, 356.

Le mensonge et le caractère. By RENÉ LE SENNE. Paris, Félix Alcan, 1931. Pp. iv, 348.

Le devoir. By RENÉ LE SENNE. Paris, Félix Alcan, 1930. Pp. vi, 604.

L'éducation fonctionnelle. By ÉDOUARD CLAPARÈDE. Paris, Delachaux & Niestlé S. A., 1931. Pp. 268.

Wandlungen der Weltanschauung. By KARL JOEL. Lieferung 10. Tübingen, J. C. B. Mohr, 1931. Pp. 561–640.

Philosophie und Weisheit. By SCHALWA NUZUBIDSE. Berlin, Ost-Europa-Verlags, 1931. Pp. iv, 220.

Metaphysik der Wirklichkeit. By ROBERT REININGER. Leipzig, Wilhelm Braumüller, 1931. Pp. xii, 408.

NOTES

Professor George Herbert Mead, Chairman of the Department of Philosophy at the University of Chicago, died at Chicago on April 26, 1931. He was born in South Hadley, Massachusetts, February 27, 1863. He received the degree of Bachelor of Arts from Oberlin College in 1883 and from Harvard University in 1888. After three years of study in the Universities of Leipzig and Berlin and a period of service at the University of Michigan, he became a member of the faculty of the University of Chicago in 1894, where he remained and taught until the time of his death. His retirement had been announced to take place at the end of the present academic year. He was to have been visiting Professor of Philosophy at Columbia University, 1931–32. His Carus Lectures, 1930, before the American Philosophical Association, are to be prepared for publication by Professor Arthur E. Murphy. His published essays, substantial and provocative, were brilliantly supplemented, not to say outweighed, by the living impact of the man upon his more immediate environment. He sustained a profound reputation as a teacher and original thinker at the University of Chicago; and his vigorous and wholesome personality left its mark upon many segments of the life of the city of Chicago.

The Second International Hegelian Congress will be held in Berlin on October 18–21, 1931, this year being the centenary of Hegel's death. The provisional program is as follows:

Sunday, October 18—Conversation.
Monday Morning, October 19—Opening meeting. Addresses of welcome.
Monday to Wednesday, October 19–21—Papers on the Hegelian philosophy.

The following scholars have already undertaken to read papers:

BAILLIE (Leeds) ..... *Die Bedeutung der Phänomenologie des Geistes.*
HESSING (Bennekom) ..... *Das Wesen der Dialektik.*
CALOGERO (Rome) ..... *Das Problem der Hegelschen Logik.*
WIGERSMA (Haarlem) ..... *Die Hegelsche Philosophie der Natur.*
BAER (Halle) ..... *Hegel und die Mathematik.*
TSCHIŽEWSKI (Zähringen) ..... *Hegel und die Sprachphilosophie.*
LARENZ (Göttingen) ..... *Hegel und das Privatrecht.*
GLOCKNER (Heidelberg) ..... *Die Aesthetik in Hegels System der Philosophie.*
WOLFF (Hamburg) ..... *Hegel und Shakespeare.*
LASSON (Berlin) ..... *Hegels Religionsphilosophie.*
STENZEL (Kiel) ..... *Hegels Auffassung der griechischen Philosophie.*
KRONER (Kiel) ..... *Hegel und die Gegenwart.*

Arrangements will be made for an excursion, a dinner, a reception at the *Ministerium für Wissenschaft, Kunst und Volksbildung*, an exhibition of

Hegelian manuscripts, and so on. The subscription to the Congress is RM. 10. Persons who wish to take part are requested to write as early as possible to Dr. Helfried Hartmann, Berlin-Britz, O.-Bräsigstrasse 34.

The Oxford Translation of Aristotle was completed during the spring of the present year by the publication of Professor J. A. Smith's translation of the *De Anima*, which forms part of Volume III. The whole work makes eleven volumes. The first part to be translated, which, by a curious coincidence, is also included in Volume III, appeared in 1908. The series was undertaken at the desire of Benjamin Jowett, and its publication has been assisted by the Jowett Copyright Fund.

The Creighton Club was entertained by Colgate University on April 24 and 25. Professor T. V. Smith, of the University of Chicago, read a paper on *Social Intelligence and the Communistic Experiment*. Professor Paul W. Ward of Syracuse University read on *The Notion of Value*, and Professor H. B. Jefferson of Colgate University on *The God of Philosophy and the God of Religion*.

The Kant-Gesellschaft met at Halle, May 27–29. The main discussion was lead by Professor Nicolai Hartmann of the University of Berlin on the topic "Die Wendung der Philosophie der Gegenwart zu Ontologie und Realismus".

The following is a list of articles in current philosophical periodicals:

MIND, XL, 158: *Jean Piaget*, Le Développement Intellectuel chez les Jeunes Enfants; *Ralph E. Stedman*, An Examination of Bosanquet's Doctrine of Self-transcendence (I); *A. D. Ritchie*, The Relations of Mental and Physical Processes; *John Wisdom*, Logical Constructions (I); *C. A. Strong*, Is Perception Direct, or Representative?

THE MONIST, XLI, 2: *J. L. Stocks*, The Golden Mean; *Louis Arnaud Reid*, Value and Æsthetic Experience; *R. F. Alfred Hoernlé*, The "Reality" of the Imaginary; *Edward O. Sisson*, A Preface to Logic (II); *F. Creedy*, Logic as the Cross-Classification and Selection of Arbitrary Elements; *Peter A. Carmichael*, Change; *D. W. Gotshalk*, Change Is Substance; *Peter A. Carmichael*, Reply to Mr. Gotshalk.

PHILOSOPHY, VI, 22 (The Journal of Philosophical Studies): *Sir J. Arthur Thomson*, Purpose in Evolution; *Guido de Ruggiero*, Science, History and Philosophy; *Norman Campbell*, The Errors of Sir Arthur Eddington; *H. Wildon Carr*, Imaginings and Reasoning; *W. G. de Burgh*, Right and Good: The Limits of Ethics; *William Brown*, Hypnotism and Suggestion.

THE JOURNAL OF PHILOSOPHY, XXVIII, 6: *Arthur E. Murphy*, Report of the California Meeting of the American Philosophical Association. 7: *John Storck*, Francis Bacon and Contemporary Philosophical Difficulties. 8: *A. C. Armstrong*, Kant's Philosophy of Peace and War; John Wright Buckham, Immanence-Transcendence. 9: *Constance Rathbun*, The Place of Repression in Morality; *Durant Drake*, On Defining "Existence". 10: *A. Myrton Frye*,

Moral Freedom and Power; *Philip Miller Kretschmann*, The Problem of Gravitation in Aristotle and the New Physics.

THE INTERNATIONAL JOURNAL OF ETHICS, XLI, 3: *A. P. Brogan*, Objective Pluralism in the Theory of Value; *W. Macmahon Ball*, The Limits of Political Obligation; *Fowler Vincent Harper*, The Pragmatist Process in Law; *R. Naga Raja Sarma*, Ethics of Divorce in Ancient India.

THE SYMPOSIUM, II, 1: *Ramon Fernandez*, Thought and Revolution; *Arthur Wubnig*, Economic Rationalization; *James Burnham*, Trying to Say; *Louis Zukofsky*, American Poetry 1920–1930; *Edwin Berry Burgum*, The Humanism of Matthew Arnold. 2: *Harold Rosenberg*, Myth and Poem; *D. S. Von Mohrenschildt*, Aspects of Proust as a Novelist of Manners; *T. O. Beachcroft*, Mysticism as Criticism; *I. A. Richards*, Between Truth and Truth.

THE HIBBERT JOURNAL, XXIX, 3: *Sir Oliver Lodge*, The Interaction of Life and Matter; *F. S. Marvin*, A Mathematical Universe; *H. Wildon Carr*, Is There a World-Soul?; *D. F. Fraser-Harris*, Mind and Body (I); *W. Benjamin Smith*, Mind and Body (II); *Harold P. Cooke*, The Philosopher's Neglect of the Obvious; *Nowell Smith*, The Religious Philosophy of Arthur Clutton-Brock; *W. F. R. Hardie*, The Philosophy of G. K. Chesterton; *Ralph E. Stedman*, Bosanquet's Account of Religion; *M. Whitcomb Hess*, A Quaker Plotinus; *The Hon. R. Erskine of Marr*, The Gentle Skeptics; *Harold E. B. Speight*, An Educational Dilemma; *W. J. Blyton*, Two Modern Thrusts at Belief; *S. F. Darwin Fox*, The Claim to Equality with Christ; *F. R. Hoare*, Voluntary Poverty; *Austin Warren*, Bronson Alcott, The Orphic Sage.

THE JOURNAL OF RELIGION, XI, 2: *Shailer Mathews*, Social Patterns and the Idea of God; *Martin Dibelius*, Jesus in Contemporary German Theology; *J. E. Turner*, Freud and the Illusion of Religion; *B. W. Bacon*, Johannes Redivivus; *William Creighton Graham*, The Religion of the Hebrews; *Charles T. Holman*, The Case-Work Method in the Cure of Souls.

THE NEW SCHOLASTICISM, V, 2: *Kurt F. Reinhardt*, Fundamental Notions of Mysticism; *Beryl Smalley and George Lacombe*, The Lombard's Commentary on Isaias and Other Fragments.

ANGLICAN THEOLOGICAL REVIEW, XIII, 2: *B. W. Bacon*, Is Baptism Syncretistic?; *Francis J. Hall*, Miracle; *Hope Henry Lumpkin*, Hugh Latimer, Bishop and Doctor, Social Prophet of the Sixteenth Century; *Samuel A. B. Mercer*, The Ethiopians and Some of their Religious Problems; *Burton Scott Easton*, The Mind of Christ in Paul; *B. W. Bacon*, A Review Reviewed.

THE HARVARD THEOLOGICAL REVIEW, XXIV, 1: *George La Piana*, Ancient and Modern Christian Apologetics; *Hastings Eells*, The Contributions of Martin Bucer to the Reformation; *Robert P. Casey*, Armenian Manuscripts of St. Athanasius of Alexandria.

THE AUSTRALASIAN JOURNAL OF PSYCHOLOGY AND PHILOSOPHY, IX, 1: *Francis Anderson*, Sidelights: 1. On Sidelights in General; *W. Anderson*, Individual and Community (11); *Richard Lawson*, Poetry and Philosophy, and "The Testament of Beauty"; *H. Tasman Lovell*, Character and Personality; *R. Simmat*, Modern Advertising; *E. Ronald Walker*, Some Economic Aspects of Vocational Guidance.

THE BRITISH JOURNAL OF PSYCHOLOGY, XXI, 4: *Robert H. Thouless*, Phenomenal Regression to the Real Object; *James Drever*, In what Sense can we speak of Primary Colours?; *M. D. Vernon*, Characteristics of Proof-Reading; *H. Banister* and *J. M. Blackburn*, An Eye Factor Affecting Proficiency at Ball Games; *J. M. Blackburn*, Individual Differences in the Performance of a Simple Test; *J. L. Prak*, An Empirical Research on the Reliability of Correlation Coefficients; *J. Rumyaneck*, The Comparative Psychology of Jews and Non-Jews: a Survey of the Literature; *T. H. Pear*, A Further Note on Euphasia.

THE AMERICAN JOURNAL OF PSYCHOLOGY, XLIII, 2: *E. M. Twitmyer*, Visual Guidance in Motor Learning; *W. Piper*, Sources and Processes in the Writing of Fiction; *H. Easley*, An Attempt to Isolate the Factor of 'Attention'; *H. Bowers*, Studies in Visual Imagery; *A. G. Bills*, Blocking: A New Principle of Mental Fatigue; *E. Freeman*, The Achromatic Sensitivity of the Dark-Adapted Retina in Relation to Stimulus-Distance; *C. O. Weber*, Visual-Motor Coördination in Concave and Convex Mirror Space; *M. O. Wilson* and *L. B. Dolan*, Handedness and Ability; *A. B. Crawford* and *E. M. Ligon*, A Case of Solar Blindness.

PSYCHOLOGICAL REVIEW, XXXVIII, 3: *Maurice H. Krout*, Heredity, Environment, and Developmental Process; *Harvey A. Carr*, The Laws of Association; *Mary Frances Robinson*, Is the Refractory Phase Theory Adequate to Explain Mental Fatigue?; *George W. Hartmann*, The Concept and Criteria of Insight; *Siegen K. Chou*, Cinematography of Psychologies.

JOURNAL OF EXPERIMENTAL PSYCHOLOGY, XIV, 2: *P. T. Young*, The Rôle of Head Movements in Auditory Localization; *H. E. Jones*, Dextrality as a Function of Age; *J. Peterson* and *L. W. Allison*, Controls of the Eye-Wink Mechanism; *A. Ford*, The Correlator; *N. B. Cuff*, A Study of Eyedness and Handedness; *R. G. Krueger*, An Improved System of Kymographic Recording; *H. A. Copeland*, An Apparatus for Recording Electrical Changes; *J. B. Stroud*, Apparatus for Measuring Muscular Tensions.

PSYCHOLOGICAL BULLETIN, XXVIII, 3: Proceedings of the Thirty-eighth Annual Meeting of the American Psychological Association, Iowa City, Iowa, December 29, 30, 31, 1930. 4: Child Psychology Number (Edited by *J. E. Anderson*): General Reviews and Summaries.

REVUE DE MÉTAPHYSIQUE ET DE MORALE, XXXVIII, 1: *B. Croce*, Antihistoricisme; *É. Cartan*, Le parallélisme absolu et le théorie unitaire du champ; *L. Brunschvicg*, De la vraie et de la fausse conversion; *J. Laporte*, Le libre arbitre et l'attention selon saint Thomas; *R. Le Senne*, Sur deux objections usuelles contre l'idealisme absolu; *É. Duprat*, Les rapports de la connaissance et de l'action, d'après John Dewey; *M. Winter*, Introduction à l'étude de la mécanique ondulatoire, par L. de Broglie.

REVUE D'HISTOIRE DE LA PHILOSOPHIE, IV, 4: *Raymond-Lucien Klee*, La théorie et la pratique dans la cité platonicienne; *G. Cantecor*, L'oisive adolescence de Descartes (2e article).

BULLETIN DE LA SOCIÉTÉ FRANÇAISE DE PHILOSOPHIE, XXX, 2: *M. Léon Brunschvicg*, Le déterminisme et la causalité dans la physique contemporaine.

ARCHIVES DE PSYCHOLOGIE, XXII, 88: *C. Spearman*, La théorie des facteurs; *Richard Meili*, À propos de la théorie des facteurs; *Ed. Claparède*, L'émotion "pure"; *F. Santschi*, Nouvelles expériences sur l'orientation des tapinoma par secrétions dromographiques; *Charles Frey*, La conception du mal chez les païens bamoums; *Ed. Claparède*, L'histoire de la psychologie expérimentale, à propos du livre d'Edw. G. Boring.

KANT-STUDIEN, XXXV, 4: *J. Geffcken*, Unser Ringen um das Verständnis des Griechentums; *Emil Utitz*, Zur Philosophie der Jugend; *H. Gomperz*, Kann die Deduktion zu "neuen" Ergebnissen führen?; *Harald Höffding*, Zur Stellung der Erkenntnistheorie in unserer Zeit; *H. Kuhn*, Das Problem des Standpunkts und die geschichtliche Erkenntnis; *O. Engel*, Vom Verhältnis Christof Schrempfs zu Immanuel Kant; *M. Buber*, Franz Rosenzweig †.

SCHOLASTIK, VI, 2: *Heinrich Weisweiler*, Die Impanationslehre des Johannes Quidort; *Joseph de Vries*, Geschichtliches zum Streit um die metaphysischen Prinzipien; *Artur Landgraf*, Die Vorbereitung auf die Rechtfertigung und die Eingiessung der heiligmachenden Gnade in der Frühscholastik; *Fr. Hürth*, Lehräusserungen der Kirche, Litterae encyclicae "Casti connubii".

ARCHIV FÜR GESCHICHTE DER PHILOSOPHIE, XL, 1: *H. Rickert*, Geschichte und System der Philosophie; *E. Hoffmann*, Der pädagogische Gedanke in Platons Höhlengleichnis; *H. Flatten*, Die "materia primordialis" in der Schule von Chartres; *B. Groethuysen*, Die kosmische Anthropologie des Bovillus; *H. Kuhn*, Hegels Ästhetik als System des Klassizismus; *H. Glockner*, Kuno Fischer und Karl Rosenkranz; *A. Dyroff*, Jahresbericht 1930 über die deutschen Schriften zur Patristik; *G. Dawes Hicks*, Jahresbericht 1930 über die englischen Schriften zur Antike; *G. Calogero*, Jahresbericht 1930 über die italienischen Schriften zur Antike.

RIVISTA DI FILOSOFIA NEO-SCOLASTICA, XXIII, 1–2: *Martino Grabmann*, L'influsso di Alberto Magno sulla vita intellettuale; *S. Vanni-Rovighi*, L'immortalità dell'anima nel pensiero di G. Duns Scoto; *Gustavo Bontadini*, Realismo e spiritualismo nel pensiero di Giuseppe Tarozzi.

GIORNALE CRITICO DELLA FILOSOFIA ITALIANA, XII, 1: *Giovanni Gentile*, Il concetto della natura nel moderno idealismo; *Gallo Galli*, La realità spirituale e il problema dell'oggetto (contin.); *G. de Giuli*, Abelardo e la morale; *Giovanni Tinivella*, Saggio sulla dottrina di Bacone (contin.).